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TP 9126E

DEVELOPMENT OF A KNOWLEDGE-BASED SYSTEM
FOR THE
RESOLUTION OF ELECTROMAGNETIC INTERFERENCE

TECHNICAL REPORT

PREPARED
FOR

Transportation
Development Centre
Transport Canada

BY

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Un sommaire en francais de ce rapport est inclus avant la table des matieres.

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The unique nature of a knowledge-based system project requires extensive cooperation between the customer and supplier to create the system. The project team consisted of:

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17 Abstract

This document describes the development of a software package designed to diagnose interference in radio communications. It covers the overall system requirements, the functional modules, and the detailed programming code.

A diagnostic expert system was designed to query a user and to formulate a diagnosis based on the heuristics obtained from a domain expert. The software was implemented using Insight 2+ (now called Level 5). It was designed to appear as a regular utility on a PC, and contains extensive help and tutorial facilities.

In addition to its diagnostic mode, the system also generates the usual documents required by Transport Canada when investigating radio frequency interference.

The system also contains a training mode so that regular reporting and recording can be bypassed when the system is used for training.

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17 Résumé

Compte rendu des travaux de développement d'un progiciel conçu pour aider à diagnostiquer la nature des brouillages électromagnétiques dans les communications hertziennes. Il traite des caractéristiques générales du progiciel, de ses modules et de son code de programmation, ce dernier en détail.

Le progiciel est capable de dialoguer avec un interlocuteur et de déboucher sur un diagnostic fondé sur des raisonnements analogues à ceux qu'aurait un expert dans le domaine considéré. Le logiciel est écrit en langage Insight 2+ (maintenant appelé Niveau 5). En plus de pouvoir servir de programme utilitaire fonctionnant sur un PC, ce progiciel renferme des fonctions de dépannage et d'apprentissage.

Lorsqu'il ne sert pas aux diagnostics, le progiciel peut produire les documents habituels dont Transports Canada a besoin lorsqu'on lui demande d'enquêter sur les perturbations haute fréquence.

Enfin, grâce au mode apprentissage, le progiciel peut servir exclusivement à cet usage, court-circuitant les modes habituels d'édition et d'enregistrement.

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SUMMARY

This document forms the final report for a project to develop a diagnostic system for the resolution of electromagnetic interference in radio systems. The work was proposed under the Unsolicited Proposals program of the Department of Supply and Services and administered by the Transportation Development Centre (TDC).

In addition to TDC's main goal of producing a workable system to aid in the diagnosis of interference, a secondary goal was to gather experience in the administration of an expert system project. On both counts the project was successful.

Diagnostic systems are classical in nature, being one of the first applications of expert systems software. This system followed the classical functional partitions of a question and answer session followed by the formulation of a hypothesis set of possible causes. This was followed by a set of tests performed by the user to either narrow down the hypothesis set and/or to confirm the potential cause. A final set of corrective measures was then suggested which should clear the problem.

The over all project requirement was to create a usable piece of software and to incorporate as much of the technical knowledge as possible into the various HELP menus and thereby reduce the need to consult manuals during a session. In addition, as much as possible an attempt was made to capture and reproduce the standard documentation normally completed when interference was experienced.

The design of the system proceeded in two steps. First, from the general requirements it was necessary to define in consultation with the advisory team the structure and format of each screen display and the internal functions necessary to create a useable system. The results of this are described in detail in Part 1.

The next step was for the design team to complete the logical design of the system. This involved creating the functional modules that would generate the appropriate user interface, and carry out the necessary inferencing to complete the diagnosis. This phase also involves proposing the test programs that would be run to create a validation for final sign-off. Part 2 describes in more detail the logical design of the software.

The perennial question of deskilling of the expert was dealt with in an interesting fashion. Each diagnostic session was recorded and a complete trace is returned to the expert. In the event of inappropriate conclusions or an inability to formulate a response, the expert can accumulate new approaches to the software. This leaves the expert to deal with the hard problems, and should enhance his/her experience rather than from it.

The administration of the project followed a very standard set of milestone meeting and progress reports. Several major deviations in path were taken after discussions with the management team from TDC. An expert system is a software project with some interesting differences in terms of the need for expert consultations, and a need for a flexible approach to unknowns that are bound to develop and the expertise is captured and represented. Good project management and good software engineering however seemed sufficient to maintain progress and resulted in a successful ending.

SOMMAIRE

Ce document constitue le rapport final des travaux de développement d'un progiciel conçu pour aider à diagnostiquer les brouillages électromagnétiques dans les communications hertziennes. La recherche a été faite dans le cadre du programme de propositions spontanées d'Approvisionnements et Services Canada, sous l'égide du Centre de développement des transports (CDT) Transports Canada.

L'objectif fixé à la recherche a été double: mise au point d'un système fonctionnel et accumulation de connaissances dans la gestion d'un projet de recherche touchant les systèmes experts. Ces deux objectifs ont connu un plein succès.

Pour ce qui est de la fonction de diagnostic, d'ailleurs l'une des premières applications de tout système expert, l'approche a été classique. Il y a eu tout d'abord une séance de questions-réponses, suivie d'une sélection des causes les plus probables, puis d'une batterie de tests dans le but de cerner la cause réelle par un processus d'élimination, de confirmer celle-ci, ou les deux. Enfin, des correctifs ont été proposés pour que ce problème ne se reproduise plus.

La recherche visait surtout l'élaboration d'un progiciel fonctionnel dans lequel seraient intégrées toutes les connaissances possibles, que l'on interrogerait interactivement et qui dispenserait, dans toute la mesure du possible, du besoin de consulter les manuels de dépannage. En outre, le progiciel devrait pouvoir produire les documents qui sont toujours nécessaires lorsqu'il s'agit d'enquêter sur la nature d'une perturbation haute fréquence.

L'étude du système s'est faite en deux temps. D'abord, définition de la structure et du format de chaque visualisation, et des fonctions intérieures nécessaires. Ensuite, étude de la logique, y compris l'élaboration des modules permettant de reproduire la démarche intellectuelle de l'utilisateur et de déboucher sur un diagnostic fondé sur des raisonnements analogues à ceux d'un expert. Cette phase comprenait également les programmes d'essais visant à obtenir validation et approbation de la part de l'expert.

Le processus par lequel la démarche intellectuelle de l'expert a pu être reconstituée a été innovant. Des séances de diagnostic ont été organisées, enregistrées in extenso et transmises à l'expert. Lorsque le système était incapable de proposer une solution ou lorsque celle-ci était jugée inappropriée, l'expert se chargeait d'affiner le programme. En plus de décharger l'expert de questions routinières laissées désormais au progiciel, cette façon de procéder à permis à l'expert de creuser ses connaissances et de donner plein champ à ses aptitudes particulières.

TABLE OF CONTENTS

Page No.

PART 1: SYSTEM DESIGN

1.1 INTRODUCTION 1

1.2 RELEVANT DOCUMENTS 1

1.3 THE PROBLEM STATEMENT 2

1.3.1 THE DIAGNOSTIC PROBLEM 2
1.3.2 REQUIREMENTS OVERVIEW 4

1.4 SYSTEM DESIGN 5
1.4.1 OPERATIONAL MODES 5
1.4.2 THE GENERAL ARCHITECTURE 6
1.4.3 REPORT GENERATION 6
1.4.4 MAINTENANCE 6
1.4.5 GENERAL SYSTEMS ATTRIBUTES 7
1.4.6 DEALING WITH UNCERTAIN DATA INPUT 8
1.4.7 DEALING WITH INCONSISTENT RESPONSES 9

1.5 PERFORMANCE TESTING 9

1.6 FUNCTIONAL EXTENSIONS 10

1.7 SUMMARY 11

PART 2: LOGICAL DESIGN

2.1 INTRODUCTION 13
2.2 REQUIRED FUNCTIONALITY 13
2.3 FUNCTIONAL ARCHITECTURE 16
2.3.1 INTRODUCTION 16
2.3.2 OVERVIEW 16
2.3.3 SESSION FILE OPERATIONS AND THE DATA ACQUISITION KNOWLEDGE BASE FOR EMI 20
2.3.4 SUPPORT SOFTWARE 25
2.3.5 MAINTENANCE 28

2.4 ACCEPTANCE AND VALIDATION 29

2.5 CONCLUSIONS 29

APPENDICES

A: REQUIREMENTS DEFINITION
B: DIAGNOSTIC QUESTIONS
C: SUPPORT WEIGHTS OF THE EVIDENCE
D: CODE

LIST OF FIGURES

FIGURE 1: EMI:LOGICAL BLOCKS 17
FIGURE 2: EMI:KNOWLEDGE-BASE SESSION 19
FIGURE 3: EMI:KNOWLEDGE-BASE LOGICAL BLOCKS . . . 21
FIGURE 4: EMI:KNOWLEDGE-BASE QUESTION FLOW 22

LIST OF ABBREVIATIONS

AI - Artificial Intelligence

EMC - Electromagnetic Compatibility

EMI - Electromagnetic Interference

EMIR - Electromagnetic Interference Resolution

ES - Expert System

KBS - Knowledge-Based System

RA - Requirements Analysis

RD - Requirements Definition

TC - Transport Canada

TDC - Transportation Development Centre

PART 1: SYSTEM DESIGN

1.1 INTRODUCTION

The increasing density and complexity of modern radio communications systems and the crowded electromagnetic environment make electromagnetic interference (EMI) a growing concern. To ensure electromagnetic compatibility (EMC) in Transport Canada (TC) installations such as airports and air traffic control centres, improved methods for systems design, installation and maintenance are required. When EMI is identified as a problem, steps are taken to identify and resolve the interference which may be caused by radiation sources such as broadcast stations, air/ground transmitters, computing devices, vehicular electrical systems, etc.

Current techniques involve professional investigation by TC specialists according to flow-charts, and test procedures. This is a highly skilled process that often requires intensive involvement by headquarters personnel. With the emergence of Artificial Intelligence tools to create expert systems (or knowledge-based systems), some of the identification and resolution activities may be aided by computerized references.

This project is intended to develop such a knowledge-based system. The requirements definition phase of such a project defines the functional as well as the nonfunctional (such as the colour of the keyboard) requirements, and the constraints under which this functionality is to be derived. As well, both the physical and logical attributes of the system must be specified. The requirements definition will provide the material from which the design process can begin and on which results can be measured.

In **Section 1.2**, a complete list of associated documents is presented. In **Section 1.3**, a statement of the diagnostic problem is presented. This section serves both to introduce the present system and to formulate the generalities of this class of expert system.

In **Section 1.4**, a review of the system design issues is presented. This section provides an overview of the major issues and their solutions.

Section 1.5, presents a standard test pattern followed during validation and testing. The responses given here represent an expert's view of the appropriate responses based on a complete knowledge of the situation and the environment.

Because part of the overall aim was to familiarize the Transportation Development Centre (TDC) with the management of such projects, we have included more material that might seem appropriate, in order to provide a single reference source.

1.2 RELEVANT DOCUMENTS

A Knowledge-Based System for the Resolution of Electromagnetic Interference between Radio Stations: **User's Manual, TP9132E**

Identification and Resolution of Electromagnetic Interference Problems: **TC 7-3EMC - 2/1**

1.3 THE PROBLEM STATEMENT

1.3.1 THE DIAGNOSTIC PROBLEM

Expert systems which emulate the capabilities of human diagnosticians are classically the first, and still perhaps the most important, application of expert systems technology. It is the purpose of this section to outline a general model for such systems and to illustrate this model with some of the considerations the knowledge engineer must take into account when designing a specific application.

The overall model consists of a defined set of causes (illnesses, diseases, equipment failures, etc.), each of which has associated with it a potentially overlapping set of symptoms. The problem is to confirm the cause with as high a confidence as possible, and to choose a treatment that will eliminate the cause.

The diagnosis proceeds in three stages, and the procedure assumes that there is a set of observations which yields a hypothesis about the cause(s). This is followed, if necessary, by a set of tests which hopefully increases the confidence in the hypothesis or reduces the number in the set, and finally a set of treatments which removes the symptoms and eliminates the cause.

In addition, there is always some form of meta-knowledge about the a-priori probabilities of the cause occurring. This a-priori probability (or certainty) may be based on a global statistical view of the situation (e.g., the frequency of occurrence over a known sample), and it is often modified based on the local situation (e.g., a particular environment could enhance the probability of a given cause). Defining the a-priori probabilities is often a difficult task since it involves common sense, which is often difficult to quantify.

All diagnostic systems, built to date, follow, more or less, this general model. There are, however, a host of issues that the knowledge engineer must face as he adapts this model to a particular problem, other than the usual task of capturing and representing the expert's domain knowledge. First, the whole process is an example of reasoning with uncertainty. In addition, the observations are subjective as well as uncertain, as, in some cases, are the tests.

Finally, the treatments or corrective measures are usually part of the diagnosis, since, despite the most confident evidence prior to the treatment, it may still fail. Thus, the first task is to determine how the three steps are viewed and followed by the diagnostician, which really suggests how the confidence level is increased at each step. This global inferencing algorithm outlines in an algorithmic way how the observations, tests, and treatments are interrelated, usually as a function of the uncertainty associated with the first two.

In addition to the above, the tests and corrective measures usually have some equivalent cost associated with them, and choices must be made that not only minimizes the level of uncertainty, but minimizes, also, some cost function. The cost function is usually not a simple algorithm, but is based on a set of rules known to the diagnostician, and which can vary as a function of the patient and the particular environment.

When approaching the design of such a system, it is clear that the knowledge engineer must have a good background in reasoning with uncertainty. The problem must be examined to determine if one of the Bayesian models is appropriate, or perhaps certainty factors, or maybe fuzzy set theory. In addition, the solution may be constrained by the use of a particular systems builder with a predefined mechanism for dealing with uncertainty.

The second major issue is to determine how the three steps are interrelated in the expert's mind. For example, how are the observations and the tests used to arrive at a hypotheses before treatment. Given the set of possible causes of the problem, it is necessary to determine the set of symptoms which can be used to narrow down the possibilities. The probability and the subjectivity of each must be quantified and some mechanism devised to select the first hypothesis before testing begins.

The cost function of the tests and treatments has to be determined, as well as the constraints which must be considered before tests and/or treatments are suggested.

The system described here illustrates all these features. A set of nine independent causes are assumed to be creating the interference noticed in a radio receiver. A set of questions can be posed, which are used to form an initial hypothesis about which of the nine might be the cause the problem. The responses can be subjective, and in addition the causes yield symptoms which are overlapping. The tests can be performed on the receiver input and on the surrounding transmitters. Clearly, the costs of receiver testing is much cheaper than those performed on transmitters. Following the observations and testing, there may still be uncertainty as to a unique cause.

The corrective measures have a widely varying cost associated with them, from a simple transmitter tuning to moving the transmitter or the assigned frequency, both of which may be impossible or very costly.

In addition to the reasoning process that must be emulated, the acquisition of data must be such that a nonexpert can be interviewed and prompted (the telephone consultation paradigm) so that a good diagnosis is achieved. The system must be such that even when used occasionally by nonexperts the general procedure is self explanatory and easy to recall.

The **HELP** and explanation facilities must provide a complete explanation of the test and treatment procedures and considerations. In short, **EMIR** not only directs the diagnosis and offers advice on resolution, it contains the accumulated knowledge that replaces a training and/or reference manual.

Finally an important consideration is - how is the system updated and how does the expert maintain his/her skills? In **EMIR**, every diagnosis is recorded and sent back to the expert for perusal. The expert can then recreate every diagnosis session and note subtleties and variations that are occurring. These can lead to fine tuning of the rules, the certainty factors, or to the whole process of inferencing. Thus, the expert becomes the master of the expert system and deals with the really hard cases, which hones his/her skills at a high level.

1.3.2 REQUIREMENTS OVERVIEW

General

To develop expertise, techniques and equipment for the maintenance and improvement of safety, efficiency and productivity of flight operations in Canadian airspaces, and to improve the processing of acquired data and the methods of assessment of the data and generation of control decisions.

To develop within TC, experience in (a) managing expert systems projects, (b) assessing and validating such software, and (c) maintaining the software.

Specific

To develop a knowledge-based expert system to identify, analyze, resolve, and prepare reports on electromagnetic interference problems related to the use of radio equipment at TC airports, air traffic control centers, and other communications facilities.

The Operational Environment

The system was designed to operate in a normal office environment that would be considered adequate for a personal computer. The system will be disk resident along with other utilities.

Most technical officers do not deal with EMI problems on a daily basis. Thus, although familiar with the general procedures and practices, they lose the detailed knowledge necessary to include all aspects of the problem into their solutions. The system will provide this expertise with an unfailing memory for detail. The technical officer, in the end, will provide updates to the Spectrum Management Section (AANFDD) in Ottawa, which will become the store of composite knowledge.

In general, the Technical Officer approaches the problem in three steps. First, a set of symptoms are observed. From these observations a hypothesis is formulated as to the probable cause. Based on this hypothesis, a set of tests are conducted in an attempt to provide validation of the hypotheses. Finally, a set of possible corrective measures are instituted that should resolve the problem. If at any point, the hypothesis can be proven wrong, then a new hypothesis must be formulated. In the end, when all else fails, the technical officer phones the expert at TC headquarters. The process could take many days as tests and corrective measures are tried and discarded. Each unit has special problems and considerations that influence decisions. These must be understood and selected by the Technical Officer.

The system was designed based on the experience of an expert in solving EMI problems. It is partially procedural and partially based on judgment calls. It is to be designed and implemented using the functionality of an expert system (i.e., maintain a separate knowledge base and inference engine) so as to achieve the extensibility and explanatory features of this technology.

In this project, the required system is knowledge-based by commonly accepted evaluation criteria. A procedure already exists that an acknowledged expert normally follows when an electromagnetic interference problem is confronted. This algorithm suggests a set of hypotheses covering what normally causes such problems, a set of questions to isolate a reasonable hypothesis, and finally a set of tests to confirm the causes of the interference. In the end, a set of corrective measures can be suggested which should resolve the interference problem. This procedure requires experience and expertise both to evaluate the results and to choose appropriate actions during the process.

The expert's capability as outlined above was duplicated as much as possible. Fortunately, this procedure has been committed to a reference manual entitled "Identification and Resolution of Electromagnetic Interference Problems" (TC 7- 3EMC-2/1), which was available to the project team. The job was therefore, to commit this manual to software using the functionality of an expert system.

The major task was to create a system that is ergonomically pleasing to the potential Users and a reporting method that will allow the expert to maintain the system as experience is gained. In so far as possible, the system was to capture the global expertise necessary to deal with EMI, and thereby eliminate the need for on-site reference books and manuals.

1.4 SYSTEM DESIGN

1.4.1 OPERATIONAL MODES

The User sees two modes of operation: Operational mode, and Report generation mode.

Operational mode will be normally used for case studies.

Report generation mode will be entered to prepare reports for transmission to headquarters before and after a case study. Reports will be generated on paper or on a floppy disk (or both).

The interface provides auto-booting and facilities for the experienced User to bypass quickly explanations or introductions. As much as possible all entries are validity checked.

Any problem solving session, once started can be suspended to permit testing or the accumulation of further evidence. The system, on restart, must recognize, through the appropriate prompts, the desired interrupted session and return to the appropriate position.

The system contains a facility for allowing trainees to run training sessions using simulated data or results and to follow the reasoning process of the system. In this mode formal reports will not be submitted.

1.4.2 GENERAL ARCHITECTURE

The system can be thought of as three major functional blocks. The first presents the User with a series of questions, which attempt to capture as much information about the interference as possible. The responses are used to formulate a hypothesis set of possible causes. The second functional block presents a series of tests which the User must execute and input the results. These are used to confirm the hypothesis and/or to reduce the number of potential causes.

From the final hypothesis set, a set of corrective measures are presented, which should eliminate the cause.

In the event that an inexperienced User gives answers which are contradictory or in some manner yield a hypothesis set inconsistent with the test results, the system will bring to bear the expert's experience in an attempt to resolve the situation by re-asking questions and interpreting the results. In the end, of course, the system could fail and in this case the User must consult the expert.

1.4.3 REPORT GENERATION

The system has been designed to present and print the responses to the two reports normally submitted when interference is noted. This feature provides a convenient way of filling this requirement. In the event the system is being used for training, the report generation feature can be bypassed.

1.4.4 MAINTENANCE

The system software will be maintained at the Spectrum Management Section (AANFDD). Updates and modifications will be mailed to subscribers as a new disk. The on-site systems will be run-time versions, which are not modifiable by the regular user.

Maintenance is generally limited to the knowledge base, under control of the editing facilities supplied by the shell.

Two reports are generated, one at the beginning of the session and one at the end. These reports are generated in standard format, based on User queries. A disk of the session could be used to utilize the Insight 2+ facilities for tracing the session if desired.

1.4.5 GENERAL SYSTEM ATTRIBUTES

Physical

Computer

The system was developed on a PC-AT compatible system with at least 256K RAM, and a 10 Megabyte hard disk. The system uses color graphics but will run on a monochrome screen.

Language

The system builder is compatible with MS/DOS, and is directly compatible with Pascal.

Logical

The system exhibits the functionality of an expert system (i.e., a knowledge base with an inference algorithm).

An expert system should exhibit the attributes of extensibility, simplicity, and explicitness. In addition, the design addresses the issues of consistency, completeness, robustness, and transparency

These terms are commonly defined as follows:

Extensibility: The knowledge base must be regarded as an open ended set of facts and relations. This tends to be true during the acquisition phase as well as during operations. In general, the data structures and access programs must be modular enough to allow modifications and additions without forcing substantial structural revisions.

Explicitness: Because of the incremental knowledge acquisition and growth requirements of an expert system, it is necessary for the expert to determine explicitly what knowledge is present in the base (and by implication what is absent). Thus the representation should maintain an explicit representation of the domain knowledge and the expert's heuristics.

Simplicity: As much as possible the structure of the knowledge base should reflect the expert's view of his domain. It is always possible for the knowledge engineer to act as an interpretive interface between the human expert's terminology and perspective and the knowledge base. In this case, the structure of the knowledge base could be as complex as deemed desirable. However, the interface will always be a barrier and cause problems in both the acquisition and eventual growth phase.

Robustness: Of considerable importance is the ability of the system to operate near the edges of the domain. This attribute is often difficult to test: however, it can be important in many situations. Some cases of the use of the system can be conditioned on imprecise data, or indeed, on conditioned attributes and rules. Representing degrees of precision and certainty is a difficult but important part of the design process. Evaluating the results to develop confidence can be equally agonizing.

Transparency: There is almost always a .equirement to maintain a high level of transparency in the design so that the system can explain its actions, and/or request help, etc. This forces a consideration on the design, which tends to argue once again for simplicity.

1.4.6 DEALING WITH UNCERTAIN DATA INPUT

In most diagnostic situations, the presence or absence of a symptom does not by itself confirm or deny the existence of a cause. This adds some complexity to evaluating the response. Added to this is the potential use of this system by inexperienced diagnosticians.

While several mechanisms exist for incorporating uncertainty into a rule base evaluation, it is often difficult to relate the uncertainties to the actual symptoms being observed.

To deal with this problem, the following scheme was devised. The answers to each question was considered as evidence for the existence of any of the nine causes, weighted from 0 (not evidence) to 10 (great evidence). The expert then filled in a table relating all questions to each cause in terms of his evaluation of the level of support for each cause.

The results of a question and answer session were then accumulated in a matrix and the weight for each cause added to arrive at a final weight. The results were normalized and the top number plus any within ten percent were chosen as the initial hypothesis set.

Remarkably enough the system worked consistently from the beginning. A tribute to the perspicasity of the expert.

The system is however quite general in application and represents a contribution to our expertise in this area. The generation of the evidence as weights for each cause could be time consuming, although a neural computer could be programed to determine the weights automatically.

1.4.7 DEALING WITH INCONSISTENT RESPONSES

The possibility exists that the responses elicited from the User will be incorrect, or that enough unsures exist that when the tests results are evaluated they do not agree with the initial hypothesis set. This situation is disconcerting for the User and while it should only happen rarely, it was decided to incorporate an extra set of rules to attempt a reconciliation.

We obtained from the expert a set of rules that would be invoked if an analysis of such a situation were to be undertaken. These rules were incorporated into the system and they are executed whenever the test results do not agree with the original hypothesis set generated by considering the User responses.

This set of rules can ask for some questions to be reconsidered, or can re-ask some questions that were not asked in the original round. The result is an attempt to rationalize the responses and arrive at a conclusion.

If this rationalization does not work, the session is suspended and the user advised to contact the expert.

1.5 PERFORMANCE TESTING

The acceptance tests for a knowledge-based system contain the usual software validation parts which guarantee proper modularity and documentation, but differ significantly because of the inferencing which must agree with the expert rather than a given algorithm. For each cause, the expert provided us with a set of correct responses based on his knowledge of the total environment. These test cases were used throughout the program development for validation, and formed the bases of the final performance testing. The provision of such test cases is a very important part of such a project. In the following we outline how this system was validated. This was done in two parts: a physical check of components, and a logical check of the knowledge based software.

Physical

The physical portion of the system consists of a computer, printer, associated software, and the system builder. The major results of the project will be recorded on a set of master disks containing the diagnostic system.

A physical check list was prepared for sign-off to include all the deliverable such as Computer, Screen, Mouse, Documentation, Builder, system disks, etc.

Logical

Logical checks involved both the performance of the system and the means by which the performance is achieved. In many cases, it is possible to achieve the appearance of an expert system response with a classical piece of software.

In terms of a logical check-off, the attributes were grouped into performance and architectural tests.

Performance

The system correctly diagnosed nine interference problems, based on a set of appropriate responses supplied by TDC.

The User interface was tested by moving through all levels of the solution paths, all help menus and all validity checks.

The report generator was tested by generating both hard copy and magnetic copy of all case studies.

The maintenance mode was tested by altering rules and/or inserting new rules. This also demonstrated the extensibility of the software.

Architecture

The logical architecture of the system was validated by reviewing the logical design document and by walking step by step through the execution of a session to demonstrate the modularity of the software.

1.6 FUNCTIONAL EXTENSIONS

The system as it now stands can be easily extended to a wider range of causes, questions, test procedures and corrective measures. Indeed the present structure provides a shell for this expansion into a general purpose radio frequency interference diagnostic system.

The extensions could be accomplished as follows.

The set of causes and the corresponding set of questions could be expanded to cover a wider range of problems such as UHF, TV interference, mobile radio, etc. In a similar fashion, the set of tests and corrective measures could be expanded as appropriate.

In order that the User not be confronted by such a wide range of questions (many outside of his domain), either a choice could be made at the front-end (a menu selection) or a set of meta-rules could be invoked to determine the particular domain. The result would be a selection of the questions, the test procedures and the corrective measure to fit the particular domain of interest.

Such a generalized system would appear specific to each User, and yet provide the repository of a wide range of interference capabilities from different experts.

This generalized system would be a useful product.

1.7 SUMMARY

The preceding provides the basic elements of a system to fulfill the expectations of the Users. In summary we note the following:

1. System was designed and it works

The requirements were met and exceeded within the time frame estimated, and within budget. This is due to many factors: partly the knowledge, and enthusiasm of the expert, partly to the tight progress review meetings, and the help from the Transportation Development Centre personnel who provide a synergistic environment in which to work.

2. Data inputs uncertainty

The question of observational uncertainty from the User was handled in a particularly interesting way. Instead of attempting to invoke certainty factors or probabilistic estimates of the presence of a symptom, the User was asked only if a symptom was present or not (or unsure). The uncertainty was buried in the code, and based on the expert's opinion of its influence. This provided an excellent mechanism to create the hypothesis set, which keeps the interfaces with the User very simple.

3. Issues

Beta-site testing

The system must be beta tested. The mechanisms for doing this and for incorporating the resulting suggestions should be worked out.

Training

The training of Users should be worked out. Several hours of familiarity would go a long way toward User acceptance. It would probably enhance the feedback for further enhancements.

Maintenance

The maintenance of the system should be delegated to someone. Maintenance will necessitate familiarity with Insight 2+ software.

Functionality Extensions

As suggested in Section 1.6, considerable functional enhancements could be incorporated. In particular the system could be joined with a frequency assignment package, and could include a site data base so that many aspects of the questions could be derived from the data base.

Market

Marketability of the package should be undertaken. The ultimate value could be enhanced by the extensions discussed elsewhere.

Management

The management plan used to control this project worked. There are many factors which contributed to this. First the management team from TC and TDC was very enthusiastic and a good rapport was established early. The expert was not only very cooperative but a source of several very novel approaches to solving some problems. However, the use of regular progress meetings, the review of draft documents, and the general reporting structure was not overly different from any other software project.

PART 2: LOGICAL DESIGN

2.1 INTRODUCTION

This part of the document presents the logical design of the EMIR system. Normally such a design would be based on the requirements definition and it would provide the bases for the knowledge acquisition and coding phases of the project. Several deviations from the normal procedure were encountered in this project which advanced the content of this document well into the programming phase.

In Section 2.2, a statement of the required functionality is given, as drawn from the Requirements Definition. Section 2.3 outlines in detail the logical sequence ofresolving the problem. Section 2.4 covers the acceptance and validation. Finally, section 2.5 summarizes the results of the project.

2.2 REQUIRED FUNCTIONALITY

The required functionality of the system was outlined in a User Requirements document (see appendix A: Requirements Definition). The following is an except from this document, which lends a general flavor to the logical design.

Global Requirement

To develop a knowledge-based expert system to identify, analyze, resolve, and prepare reports on electromagnetic interference problems related to the use of radio equipment at TC airports, air traffic control centres, and other communications facilities.

The Application Environment

The system will operate in a normal office environment that would be considered adequate for a personal computer. Questions of the operational environment will not be addressed further. The system will be disk resident along with other utilities in regular use in the office.

System Users

The Users will be technically competent persons, normally considered knowledgeable in the use of microcomputer systems (and in EMI problems). The system will act as an advisor when problems are suspected, maintain results and prepare records, and could act as a tutor during training or review sessions.

User Interface

The User's expectations will be high. Users will expect an easy learning process, an easily recallable operational procedure and extensive HELP facilities. Any problem solving session, once started can be suspended to permit testing or the accumulation of further evidence. The system, on restart, must recognize, through the appropriate prompts, the desired interrupted session and return to the appropriate position.

In general the training should take less than one day, and the software should support sufficient help so that the system is largely self explanatory.

The user will see three modes of operation: Operational, Tutorial and Report generation mode.

Operational mode will be normally used for case studies.

Tutorial sessions will be used for training purposes and will emulate a normal session except that the results will not be reported (usually discarded at the end of a session).

Report generation mode will be entered to prepare reports for transmission to headquarters after a case study. Reports will be generated on paper or on a floppy disk (or both).

The interface must provide facilities for the experienced User to bypass quickly explanations or introductions. As much as possible, all entries will be validity checked.

Maintenance

The system software will be maintained at the Spectrum Management Section (AANFDD). Updates and modifications will be mailed to subscribers as a new disk. The on-site systems will be run-time versions, which are not modifiable by the regular user.

Maintenance will be generally limited to the knowledge base under control of the editing facilities supplied by the shell.

Two reports will be generated, one at the beginning of the session and one at the end. These reports will be generated in standard format based on user responses. A disk of the session could be used, by utilizing the Insight 2+ facilities for tracing the session, if desired.

System Attributes

Computer

The system must be developed on a PC-AT compatible system with at least 640K RAM, and a 10 Megabyte hard disk. The system will use color graphics, but will run on a monochrome screen.

Language

The system builder should be compatible with MS/DOS, and preferably be directly compatible with C or Pascal (rather than Lisp or Prolog). The builder should support graphics.

The system must exhibit the functionality of an expert system (i.e., a knowledge base with an inference algorithm).

Acceptance Tests

In the following we outline how this system will be validated. This will be done in two parts: a physical check of components, and a logical check of the knowledge based software.

Physical

The physical portion of the system consists of a computer, printer, associated software, and the system builder. The major results of the project will be recorded on a set of master disks containing the diagnostic system.

A physical check list will be prepared for sign-off to include all the deliverable such as Computer, Screen, Mouse, Documentation, Builder, system disks, etc.

Logical

Logical checks involve both the performance of the system and the means by which the performance is achieved. In many cases, it is possible to achieve the appearance of an expert system response with a classical piece of software.

In terms of a logical check-off, the attributes described in Section 5 can be grouped into performance and architectural tests.

Performance

The system must solve a set of nine problems designed by TDC to test the nine hypotheses.

The User interface will be tested by moving through all levels of the solution paths, all help menus and all validity checks.

The report generator will be tested by generating both hard copy and magnetic copy of all case studies.

The maintenance mode will be tested by altering rules and/or inserting new rules. This will also demonstrate the extensibility of the software.

Architecture

The logical architecture of the system should be validated by reviewing the logical design document and by walking step by step through the execution of a session to demonstrate the alleged modularity of the software.

Tutorial Sessions

The system should contain a facility for allowing trainees to run training sessions using simulated data or results and to follow the reasoning process of the system. In this mode it would be expected that formal reports will not be submitted. In addition records of sessions, which can be modified as part of the training, would be useful.

2.3 FUNCTIONAL ARCHITECTURE

2.3.1 INTRODUCTION

This section will discuss the logical design on three levels of detail. The first section will be based on Figures 1 and 2, and provides an overview. The second section will be based on Figures 3 and 4, and Appendix A, and it provides a close examination of the logical workings and assumptions behind logical block 3 shown in Figure 1. The third section will consist of the documented source code.

2.3.2 OVERVIEW

The system is divided into four logical blocks as shown in Figure 1.

Logical Block 1: Logo

Upon start up, the User will be presented with the Transport Canada logo and system title. The system will continue after depressing any key.

Logical Block 2: Initial Report

Before beginning a new session, the user will be presented with sequential screens based upon the Transport Canada Report Form 40-0156 Electromagnetic Interference (EMI) Report (TP2325). This information will be stored and can be immediately printed.

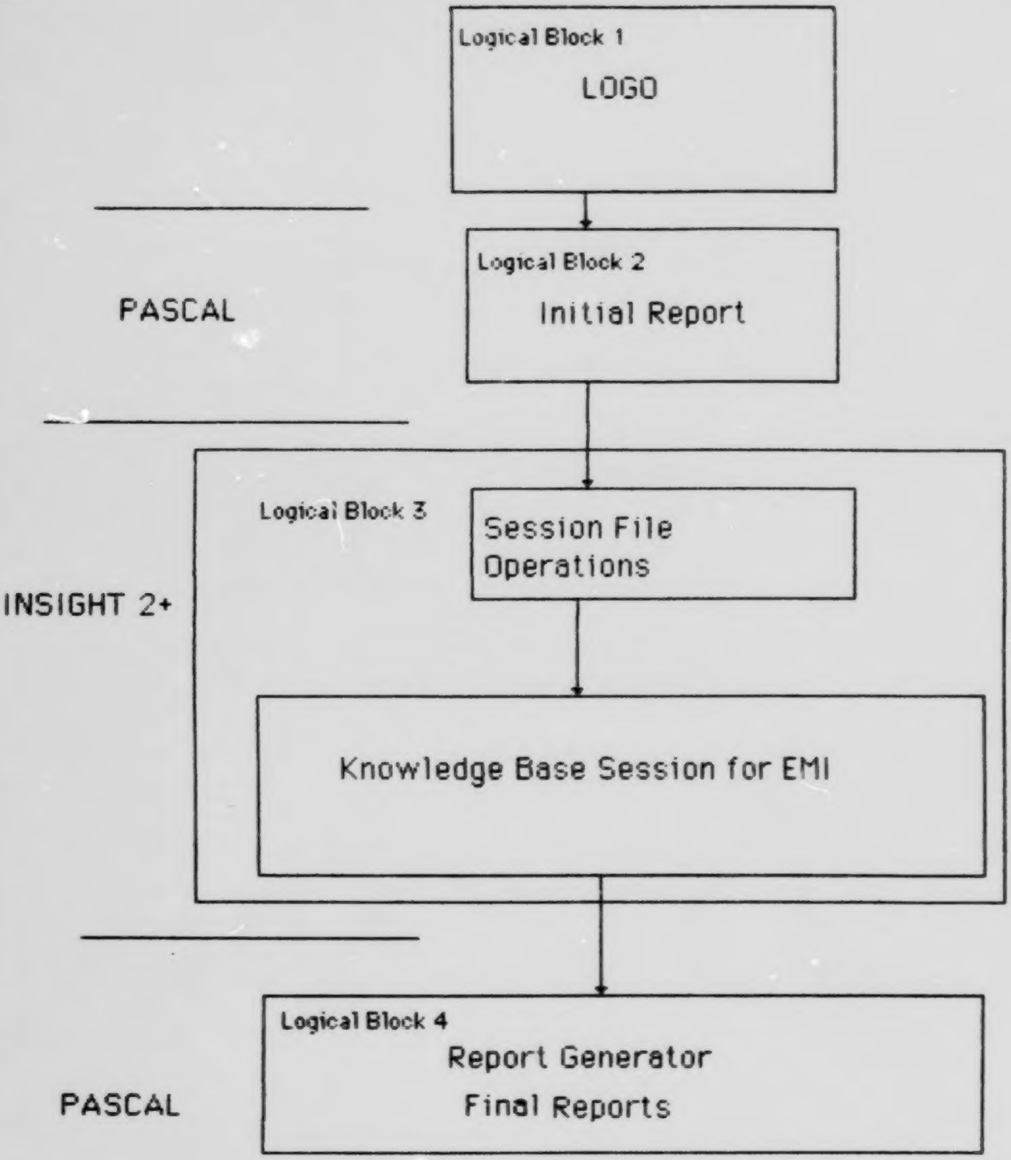

FIGURE 1: EMI: Logical Blocks

Logical Block 3: Session File Operations and Knowledge Base Session for EMI

When beginning a session, the User can enter a file operations mode in which the User has the opportunity to restore a previously saved session. At this point, the User may access sessions from different directories and delete old sessions.

The Knowledge Base Session for EMI logical sub-block 3.2 can be broken down into three parts, as displayed in Figure 2:

- The first part is to gather the information from the User and determine a hypothesis set of interferences which could be causing the problem.
- The second part is to confirm or reject each of the interferences in the hypothesis set, through a series of receiver tests.
- The final part is to suggest corrective measures to cure the interference.

In addition to the three logical parts, the experienced User is allowed to bypass parts of the program.

Logical Block 4: Report Generator

After ending a session, if the problem was solved, a case history report will be generated and printed.

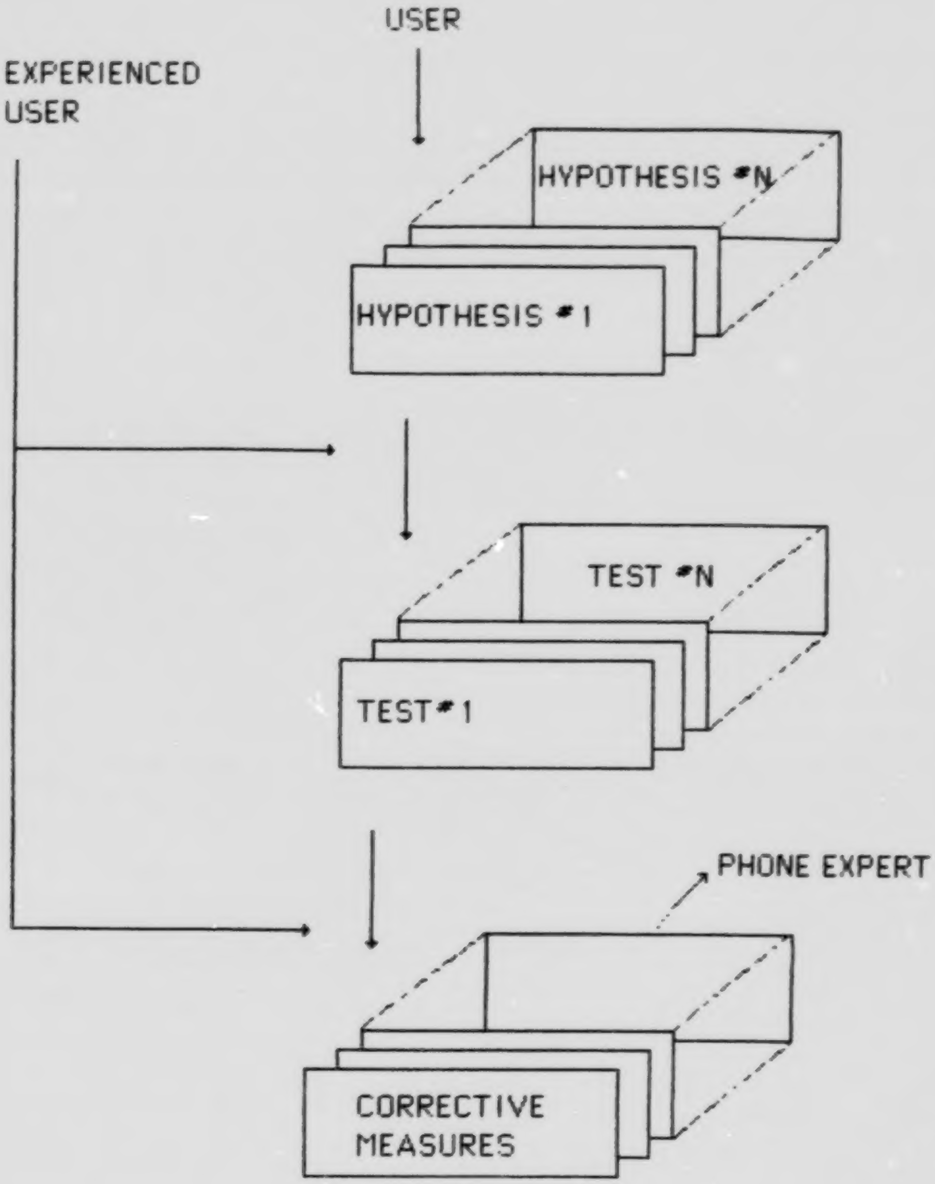

FIGURE 2:Knowledge-Base Session

2.3.3 SESSION FILE OPERATIONS AND THE DATA ACQUISITION KNOWLEDGE BASE FOR EMI

This section will examine logical block 3 of Figure 1, in more detail. The prototype is designed on the concept that the answer the User gives to each question (Appendix A) lends weight to one or more interferences, as the potentially correct hypothesis. Determining which interference is a possibility is done by calculating which has more weight assigned to it. The weighting scheme is shown in Appendix B. Figure 3 displays the overview of the EMI knowledge base, each of the blocks will be discussed later.

Upon entering the title screen display, which briefly outlines the knowledge base, the User has the option of restoring a previous session (using function key F5). The User will be presented with the names of all the saved sessions, the User may now restore a session or delete old sessions.

After passing the title screen display, the User is prompted to either start with the questions (observed symptoms) or proceed to the equipment tests or proceed directly to the corrective measures. The questions are ordered according to Figure 4. The answer to some of the questions determines which question is to be answered next.

2.3.3.1: Start entering the observed symptoms.

Each rule in this block handles one question outcome. For example, the first rule handles the 0 outcome for question six, etc. Each rule performs four tasks. However, it will only be activated when the question proceeding it has been activated.

1. The first task the rule performs is to ask the User the question and checks for its unique answer.
2. It then adds a rating to the scores of each interference based on the response to the question.
3. It also adds to the maximum score what the correct response should have been.
4. Variable "finish questions" is assigned as true in the conclusion of each rule. When all the questions have been asked then the system will proceed to the next module.

Note: In order to add a new question, first copy the form of the question to the right position in the flow. For example, where the question is to be asked. Next, the actual question asked and the corresponding weights have to be changed. The variable "STATE6?" or "STATE5?" has to be changed. These variables provide the appropriate branch out of either the first question or the other branch question.

In the text file **EMITEXT.PRL** the actual text of the question is to be filled in.

NOTE: each possible response has its own rule.

The flow of the questions is depicted in Figure 4. The questions themselves are in Appendix B:

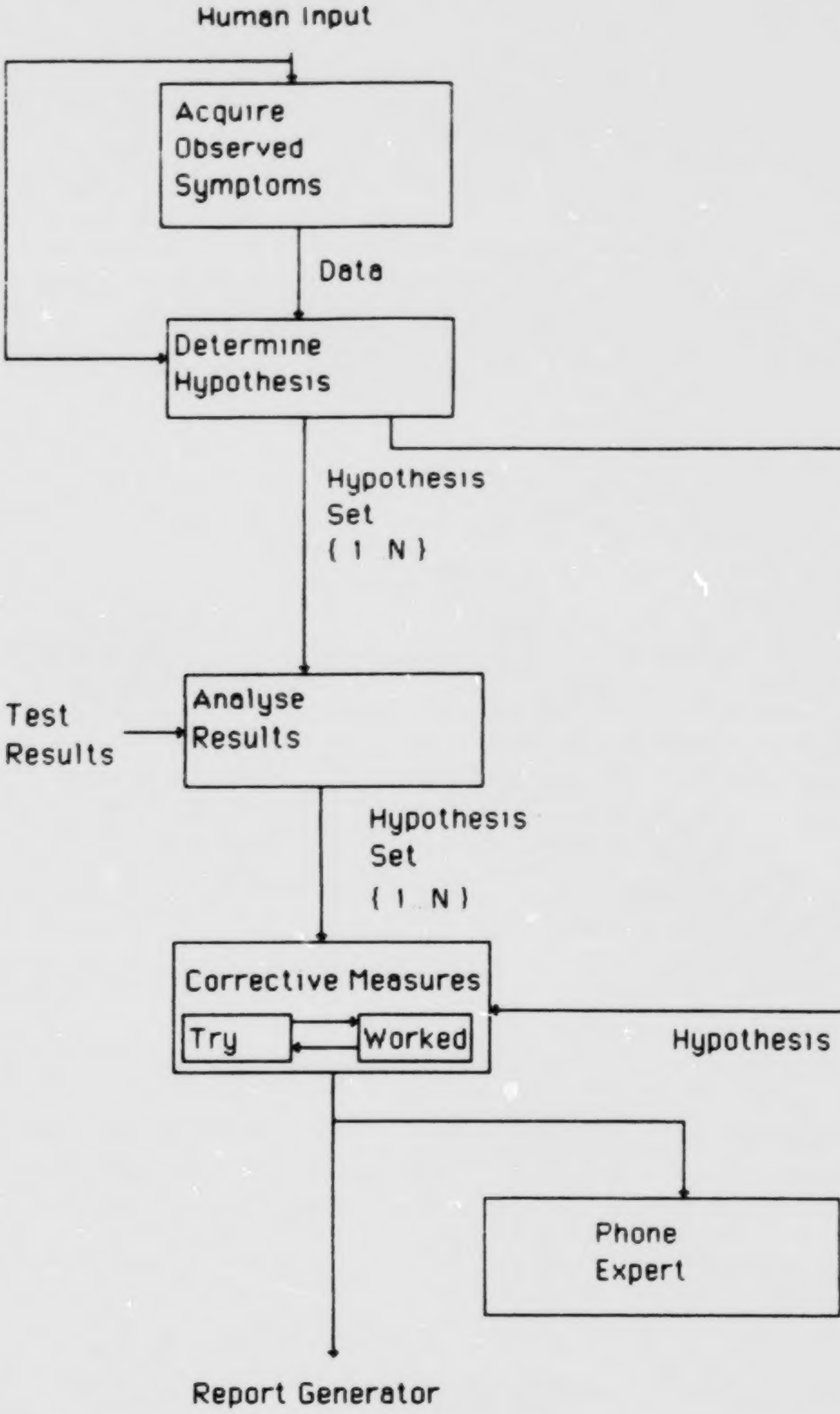

FIGURE 3: EMI: Knowledge-Base Logical Blocks

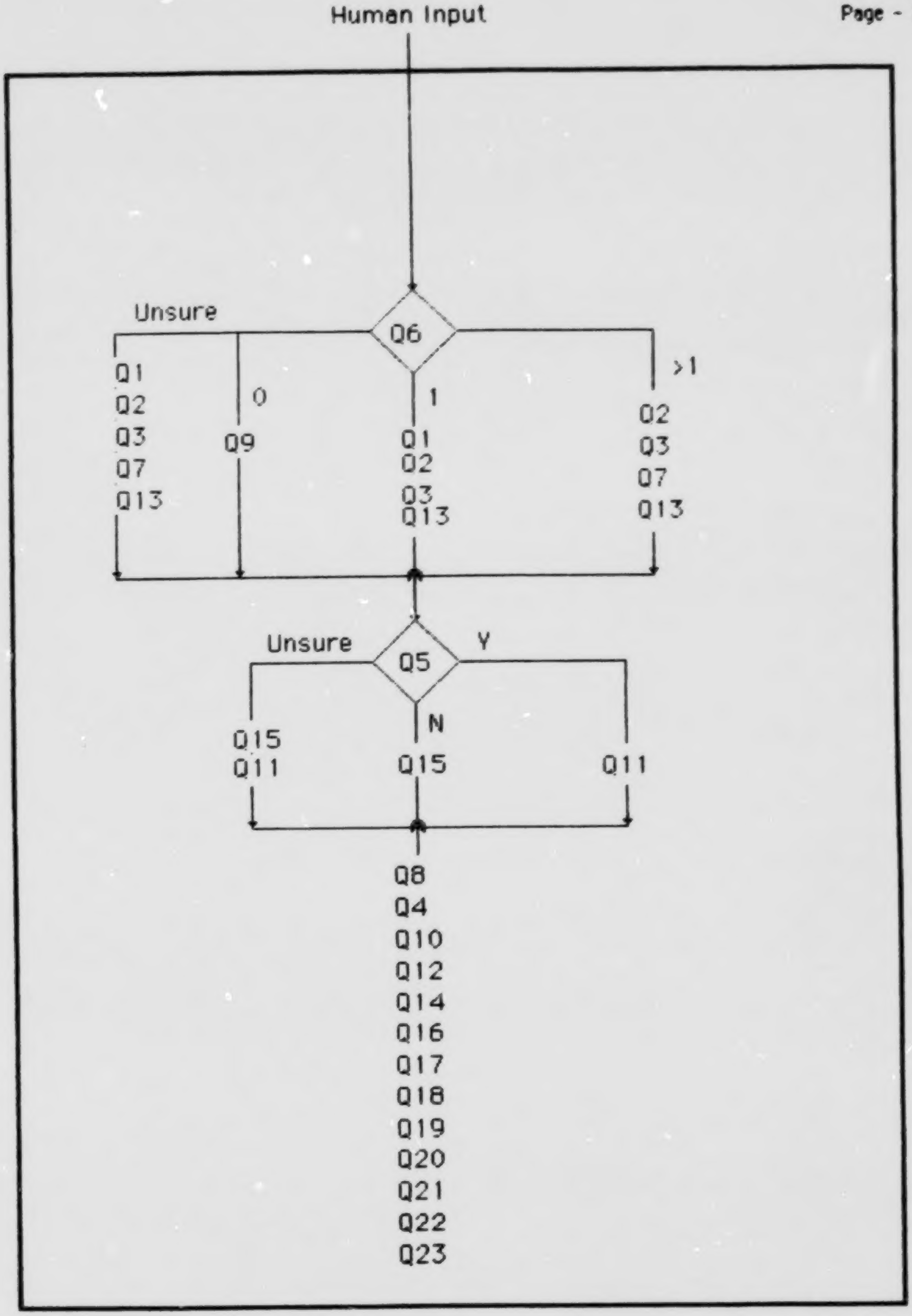

FIGURE 4:EMI:Knowledge-Base Question Flow

2.3.3.2: Proceed to the equipment tests

If the User decides to bypass the questions and start at the tests the system asks to choose which interference is suspected. They may choose any number of the nine possibilities.

The system assigns a score to the choices and a score to causes which have the same observable effects. For example, if the User indicates TI, ER, or RI it also assigns a score to TI, ER, or RI. At this point, the program will proceed to the test block with the hypothesis set to be tested.

2.3.3.3: Proceed directly to the corrective measures

Using this bypass method, the User will proceed directly to the corrective measures after indicating one interference as the suspected problem.

Upon indicating which interference is the correct one the system sets three variables, this allows the system to proceed directly into the block where the proper corrective measures will be assigned. The variables tell the system which interference is accepted and which was not. They tell the system that the observed symptoms and tests can not disagree and that the path the User chose was through this section (STATE 25).

2.3.3.4: Determine Hypothesis

In order to determine which interference should be included in the set of hypothesis to be tested, the scores accumulated during the question session must be examined. The approach here is to include the interference with the highest score and those interferences within a set range based upon the highest score.

The system is constructed so that the the top scoring interference along with those within 10% of it are included in the set of hypothesis' to be tested.

The system will enter this point after either 3.3.1 or 3.3.2. All the interferences' scores are then sent to the Pascal program (SORT.COM), and the hypothesis set is returned.

2.3.3.5: Analyze Results

This part compares the test responses to the preset correct answers. Each rule in this function is broken down into two tasks. If the interference is in the hypothesis set it checks that the tests confirm the interference. In the case of some tests, additional answers are possible, the User may answer "Interfering Signal Weak", "Unable to perform e.g. transmitter unknown", etc. The system will accept those answers and not discard an interference because the test could not be performed. The first part could be entered from Section 3.3.4.

The second task looks at the results of the above section and if no interference was confirmed it sets the variable QTDISAGREED and the system branches to the error checking module.

2.3.3.6: Corrective Measures

This task is performed if the interference is confirmed. This task could be entered from Section 3.3.3 or Section 3.3.6.

Each interference has its own section of code which contains rules to allow the User to look at the text of the corrective measures or chose an answer.

If the User chooses to look at the text of the corrective measure the system will display the text then loop back to the start of this module.

If the User chooses to indicate a successful corrective measure, the system will set the variable STATEAR and branch to the report generator.

If the User indicates the corrective measures displayed are not acceptable or did not work, then the system either branches to the next confirmed interference or to the ".. phone expert.." statement or to the report generator.

2.3.4 SUPPORT SOFTWARE

Library programs such as the screens for the reports will not be discussed here. The entire system is divided into eight main programs, each responsible for different operations. In addition, the system produces three data files:

1. The rules of the system (**EMIRULES.PRL**).
2. The text (**EMITEXT.PRL**).
3. The error checking module (**EMIERROR.PRL**).
4. A Pascal program (**SORT.PAS**) called from **EMIRULES.PRL**.
5. Initial and Final Reports
6. Logo
7. Batch File
8. Data Files

EMIRULES.PRL

This document has already explained **EMIRULES.PRL**. However, when making changes the compiler will compile **EMIRULES.PRL** into **EMIRULES.KNB**. This name must be changed to **EMI.KNB**.

When compiling, only **EMIRULES.PRL** is to be compiled. The builder will automatically join the text file and error checking module together into the compiled version.

EMITEXT.PRL

Every question or screen displayed to the User has been defined previously. This file holds the text.

The first section holds the screens sent to the User denoting various points in the system, e.g., the ending of determine hypothesis, starting of the tests, the starting of the corrective measures, the start of the report generator, etc.

The second section holds the definition for each interference.

The third section holds the text of the equipment tests and installing filters. It is activated when the User is performing the tests.

The fourth section contains help for the questions.

The fifth section contains the text of the questions.

The final section holds the text of the corrective measures.

Each section will appear on the screen exactly as it appears in this file.

EMIERROR.PRL

When the entered symptoms and the test results disagreed, the main program branches to the error checking module.

The first section checks if the User bypassed the questions, in which case it cycles to the beginning.

The second section checks for "unsure" responses and inconsistent answers. The following steps are performed:

STEP 1: The error checking module informs the User that the symptoms and tests disagree.

STEP 2: It begins its analysis of this situation by examining each symptom question's response, if it was answered "Unsure" the response is discarded and that question could be re- asked, if the question was not asked originally the question will be asked.

STEP 3: The system will then check the responses against the 21 consistency rules. These rules examine several interdependent responses of either symptom questions and/or tests at a time. If the data fails to pass the check those responses are discarded and the next consistency check rule is invoked.

STEP 4: When all the consistency check rules have been examined the system retries the responses. At this point, responses which were discarded from one of the rules but not re-asked in a succeeding rule, will be re-asked.

STEP 5: At this point the system either branches back to the main program and continues to the corrective measures module or the User is informed that the system can not solve the problem and to phone the expert.

LIMITATIONS IN CAPABILITY

Each of the rules which check for "Unsure" or inconsistent data are checked only once, for the following reasons. First, If the User can not provide an answer other than "Unsure" the system should not continually loop asking for a yes/no response. Second, if the system rejects a response and the Uer again enters an inconsistent response then either the User is inexperienced and can not provide a correct response or the situation is outside the systems domain such as multi-sourcing.

However, some of the key questions are strongly interrelated to other questions, it is possible a succeeding rule might re-ask those questions. For example, if the User indicates there is more than one modulation and there is a slight whistle heard, there are several rules which will reject this data.

Finally, there are some responses which seem to be independent and are not checked. For example, test 6. Therefore if these responses are entered incorrectly the system could fail to diagnose the problem.

SORT.PAS

This is written in pascal, **SORT.COM** is the compile and unchangeable version of **SORT.PAS.**

The first section of this code receives the interferences scores and their maximum scores sent from **EMLKNB.**

The second section normalizes each score.

The third section, sorts them in descending order.

The fourth section puts in the hypothesis set the highest score, plus those within 10% of it.

The final section sends the hypothesis set and the normalized scores back to **EMIRULES.PRL**

To change this program the Turbo-Pascal editor and compiler are needed.

INITIAL AND FINAL REPORTS

The programs responsible for the reports are written in Pascal.

The screens for the reports are generated using **"Screen Sculptor"**. Each of the screens is altered by first loading "SS". Next, chose the first option to change a screen. Pressing F10 shows the file options, choosing retrieve loads a screen. F1 is the key to the main menu. The initial reports screens are **"INPUT"**, **"INPUT1"**, **"INPUT11"**, **"INPUT2"** and **"INPUT3"**. The final reports screens are **"INPUTB1"**, and **"INPUTB2"**. Once a screen has been altered they must be saved and the system must return to the beginning menu. The option to join the screens into one turbo pascal program is chosen. The screens are combined into **"REPORT1"** or **"REPORT2"**. **Screen Sculptor** can now be exited and turbo pascal accessed.

Note, only the written text to be displayed on the screens to the User, should be changed. Other changes such as adding/deleting fields, etc. require changes to the merged files and knowledge of Pascal.

Each of the two reports are altered in order to save and print the data. Using turbo pascal access **"REPORT1.PAS"** the command "Ctrl K, R" is used to read in the program **"INSTRUCTIONS.PAS"**. First, the variable declarations lines of this file must be moved to the variables section of the main program (at the top of the file). Second, some of the main program is to be altered as explained in **"INSTRUCTIONS.PAS"**. Finally, the rest of the imported file is to be moved to the line **REPEAT** (near the bottom of the program) and replacing all the code below and including that line. This new combined program can be saved and compiled into a command file.

For the second report the imported file is called **"IN2.PAS"**. The first two variable declaration lines again contain variables which must be moved to the main programs variable section (at the top of the file). The next command contains a clear screen function which must be moved to the beginning of the main test program. Third, some of the main program is to be altered as explained in **"IN2.PAS"**. The rest of the program should be moved to the line before the last line **(END)**. This new file has to be compiled into a command file.

LOGO

The Logo screen is called **"emititle"** and can be accessed through "PcPaint". Once the screen has been altered, the User "doubleclicks" on the top right hand option of the menu column and is presented with the view of the screen without the menu columns or cursor. Pressing Shift and **"PrtSc"** saves the screen to a file called **Screen.0**, which is called by the program Picture.pas (Picture.com is the compiled version).

In Picture.pas half way through the program is a section which can be altered to change the Palette or background colors of the screen. The altered Picture.pas must be re-compiled to a command file by Turbo Pascal.

Note, while **"PcPaint"** has many colors to chose from the palette and back ground colour options chosen in Picture.pas will determine the actual colours shown on the screen. See a Turbo Pascal manual for details about the **"Palette"** command.

BATCH

The batch file **"EMI.BAT** is the program which controls the sequence of the logo, initial report and expert system. It can be viewed or altered using most word processors.

DATA FILES

Finally, the system produces three data files. The files **"EMI.DAT"** and **"EMI1.DAT"** are the two data files generated by the reports. They can be viewed, edited and printed using most word processors. The knowledge base saves its data in files with the extension CTX.

2.3.5 MAINTENANCE

For maintenance purposes it is assumed the Insight 2+ manual has been read, particularly use of the compiler and editor.

Each of the operations has been written as separate modules. The possible maintenance operations are as follows:

Changing the order of the questions: this involves moving the physical position of the question to the appropriate position in the "list" of the questions. Note the STATE6? or STATE5? must be set accordingly.

Adding a question: This involves duplicating a question rule in the proper position in the "list", changing the weights the STATE6? or STATE5? and the actual question. Next, the text of the question is entered in **EMITEXT.PRL**.

Changing the weights: Each individual response has the weights assigned to it, these can be changed. In addition, the maximum score obtained for that question must be updated for each response of that question.

Changing the text of the Help, questions, or other screen displays: The file **EMITEXT.PRL** can be accessed and the proper screen changed. Note, each screen will appear exactly as it appears in this file.

Adding help: In the file **EMITEXT.PRL** a new screen can be entered. Use other screens as examples of what to do. Note, the **KEYWORD** is **EXPAND.**

Some other modules can be changed in a similar manner, however, it is not envisaged that change will be required. Such as test results or corrective measures.

Most other complex situations require a more detailed knowledge of the program.

2.4 ACCEPTANCE AND VALIDATION

A separate document, titled "Development of a Knowledge-Based System for the Resolution of Electromagnetic Interference: Test and Validation" and dated December 1987, was prepared for approval by the project team. This procedure was followed in detail as the final acceptance.

2.5 CONCLUSIONS

This project started out to be the encapsulation of TC document **7-3EMC-2/1**; however, that document did not contain the detailed knowledge required to analyze what the responses of the User meant to each interference. As a result the project's scope was broadened to encompass the expert experience not represented in that manual. The project was again expanded to include the error checking module. However, due to the design methodology used and the versatility of the expert system technology, the whole was accomplished on-time and on-budget.

APPENDIX A: REQUIREMENTS DEFINITION

PREFACE

The increasing density and complexity of modern radio communications systems and the crowded electromagnetic environment makes electromagnetic interference (EMI) a growing concern. To ensure electromagnetic compatibility (EMC) in TC installations such as airports or air- traffic-control centers, improved methods for systems design, installation and maintenance are required. When EMI is identified as a problem, steps are taken to identify and resolve the interference which may be caused by radiation sources such as broadcast stations, air/ground transmitters, computing devices, vehicular electrical systems, etc.

Current techniques involve professional investigation by TC specialists according to flow-charts, and test procedures. This is a highly skilled process that often requires intensive involvement by headquarters personnel. With the emergence of Artificial Intelligence tools to create expert systems (or knowledge based systems), some of the identification and resolution activities may be aided by computerized references.

This project is intended to develop such a knowledge- based system. The requirements definition phase of such a project defines the functional as well as the nonfunctional requirements, and the constraints under which this functionality is to be derived. As well, both the physical and logical attributes of the system must be specified. The requirements definition will provide the material from which the design process can begin and on which results can be measured.

EXECUTIVE SUMMARY

This document represents the initial requirementdefinition for a knowledge-based system to act as an advisor to technical officers at TC facilities and regional offices when confronted with electromagnetic interference in radio communications systems. It forms the bases for agreement on what the system should do and how it should do it. The requirements are stated at a fairly high level and form a general consensus between the experts at Transport Canada and the contractor. It will be followed by a logical design document, which will outline how the requirements are met.

The system to be designed is based on the experience of an expert in solving EMI problems. It is partially algorithmic and partially based on judgment calls. It is to be designed and implemented using the functionality of an Expert System (i.e., maintain a separate knowledge base and inference engine) so as to achieve the extensibility and explanatory features of this technology.

The system will be resident on a PC compatible computer and be disk resident along with other utilities normally in use at the site. It will provide a surrogate of a resident expert on EMI problems and will, as well, maintain data and consultation records so that reports can be made to Transport Canada headquarters.

The requirements are for an easy to learn and remember system with tutorial information contained in various menus on the system.

TABLE OF CONTENTS

1. INTRODUCTION . . . . A - 3

2. OBJECTIVES . . . . A - 4
2.1 Model . . . . A - 4
2.2 Project . . . . A - 4

3. THE APPLICATION ENVIRONMENT . . . . A - 4

4. SYSTEM USERS . . . . A - 5
4.1 Introduction . . . . A - 5
4.2 The User Interface . . . . A - 5
4.3 Maintenance . . . . A - 5

5. SYSTEM ATTRIBUTES . . . . A - 6
5.1 Introduction . . . . A - 6
5.2 Physical . . . . A - 6
Computer . . . . A - 6
Language . . . . A - 6
5.3 Logical . . . . A - 6
Extensibility . . . . A - 6
Explicitness . . . . A - 6
Simplicity . . . . A - 7
Robustnes . . . . A - 7
Transparency . . . . A - 7

6. ACCEPTANCE TESTS . . . . A - 8
6.1 Introduction . . . . A - 8
6.2 Physical . . . . A - 8
6.3 Logical . . . . A - 8
6.4 Performance . . . . A - 9
6.5 Architectural . . . . A - 9

7. TUTORIAL SESSIONS . . . . A - 9

8. SUMMARY . . . . A - 9

1. INTRODUCTION

A requirements definition is assumed to be the input to the design process. It is an attempt to translate the User's perceived requirements into a formal definition that can be used as the start of the design process.

In this project, the required system is knowledge-based by commonly accepted evaluation criteria. A procedure already exists that an acknowledged expert normally follows when an electromagnetic interference problem is confronted. This algorithm suggests a set of hypotheses covering what normally causes such problems, a set of questions to isolate a reasonable hypothesis, and finally a set of tests to confirm the causes of the interference. In the end, a set of corrective measures can be suggested which should resolve the interference problem. This procedure requires experience and expertise both to evaluate the results and to choose appropriate actions during the process.

The expert's capability as outlined above is to be duplicated as much as possible. Fortunately this procedure has been committed to a reference manual entitled "Identification and Resolution of Electromagnetic Interference Problems" (TC 7-3EMC-2/1), which is available to the project team. The job is, therefore, to commit this manual to software using the functionality of an expert system.

The major task will be to create a system that is ergonomically pleasing to the potential users, and a reporting method that will allow the expert to maintain the system as experience is gained. In so far as possible, the system should capture the global expertise necessary to deal with EMI, and thereby eliminate the need for on-site reference books and manuals.

A further function of this document is to define as much as possible what will constitute acceptable performance of the delivered system. Our approach is to create an overall design and from this define a prototype using the software tools available in this field. From this prototype we will, in an interactive mode, tune the responses and the user interface so that the final product reflects a working system acceptable to all concerned.

Some of the material is replicated from the RFP and the original Unsolicited Proposal.

In Section 2, the project objectives are summarized. In Section 3, the application environment is discussed to set the frame work for the requirements.

In Section 4, the user is defined and in particular the user interface. In addition, the maintenance requirements are defined. In Section 5, the physical and logical attributes are defined. In Section 6 the general structure of the acceptance tests are defined. Section 7 discuss the possibility of conducting tutorial sessions using the system, and section 8 contains a summary.

2. PROJECT OBJECTIVES

2.1 Modal

To develop expertise, techniques and equipment for the maintenance and improvement of safety, efficiency and productivity of flight operations in Canadian airspaces, and to improve the processing of acquired data and the methods of assessment of the data and generation of control decisions.

To develop within TC, experience in (a) managing expert systems projects, (b) assessing and validating such software, and (c) maintaining the software.

2.2 Project

To develop a knowledge-based expert system to identify, analyze, resolve, and prepare reports on electromagnetic interference problems related to the use of radio equipment at TC airports, air traffic control centers, and other communications facilities.

3. THE APPLICATION ENVIRONMENT

The system will operate in a normal office environment that would be considered adequate for a personal computer. Questions of the operational environment will not be addressed further. The system will be disk resident along with other utilities in regular use in the office.

Most technical officers do not deal with EMI problems on a daily basis. Thus, although familiar with the general procedures and practices, they lose the detailed knowledge necessary to include all aspects of the problem into their solutions. The system will provide this expertise with an unfailing memory for detail. The technical officer, in the end, will provide updates to the Spectrum Management Section (AANFDD) in Ottawa, which will become the store of composite knowledge.

In general, the technical officer approaches the problem in three steps. First, a set of symptoms are observed. From these observations a hypothesis is formulated as to the probable cause. Based on this hypothesis, a set of tests are conducted in an attempt to provide validation of the hypotheses. Finally, a set of possible corrective measures are instituted that should resolve the problem. If at any point the hypothesis can be proven wrong, then a new hypothesis must be formulated In the end the technical officer phones the expert at TC headquarters when all else fails. The process could take many days as tests and corrective measures are tried and discarded. Each unit has special problems and considerations that must be understood and selected by the technical officer.

The expert might, from experience, conclude that some combined set of circumstances are causing the problem or depend on some intuitive leap to arrive at a new hypothesis. The system will examine the standard set of circumstances, and call for human help when its ability fails.

4. SYSTEM USERS

4.1 Introduction

The Users will be technically competent persons, normally considered knowledgeable in the use of microcomputer systems (and in EMI problems). The system will act as an advisor when problems are suspected, maintain results and prepare records, and could act as a tutor during training or review sessions.

4.2 User Interface

The user's expectations will be high. Users will expect an easy learning process, an easily recallable operational procedure and extensive **HELP** facilities.

Any problem solving session, once started can be suspended to permit testing or the accumulation of further evidence. The system, on restart, must recognize, through the appropriate prompts, the desired interrupted session and return to the appropriate position.

In general the training should take less than one day, and the software should support sufficient help so that the system is largely self explanatory.

There will be three modes of operation: Operational mode, Report generation mode, and Tutorial mode.

> **Operational mode** will be normally used for case studies.
>
> **Report generation mode** will be entered to prepare reports for transmission to headquarters after a case study. Reports will be generated on paper or on a floppy disk (or both).
>
> **Tutorial sessions** will be used for training purposes and will emulate a normal session except that the results will not be reported (usually discarded at the end of a session).

The interface must provide auto-booting and facilities for the experienced user to bypass quickly explanations or introductions. As much as possible all entries will be validity checked.

4.3 Maintenance

The system software will be maintained at the Spectrum Management Section (AANFDD). Updates and modifications will be mailed to subscribers as a new disk. The on-site systems will be run-time versions which are not modifiable by the regular user.

Maintenance will be generally limited to the knowledge base under control of the editing facilities supplied by the shell.

Two reports will be generated, one at the beginning of the session and one at the end. These reports will be in standard format based on user queries. A disk of the session could be used to utilize the Insight 2+ facilities for tracing the session if desired.

5. SYSTEM ATTRIBUTES

5.1 Introduction

This section describes the physical and logical attributes of the final system.

5.2 Physical

Computer

The system must be developed on a PC-AT compatible system with at least 256K RAM, and a 10 Megabyte hard disk. The system will use color graphics but will run on a monochrome screen.

Language

The system builder should be compatible with MS/DOS, and preferably be directly compatible with C or Pascal (rather than Lisp or Prolog). The builder should support graphics.

5.3 Logical

The system must exhibit the functionality of an expert system (i.e., a knowledge base with an inference algorithm).

An expert system should exhibit the attributes of extensibility, simplicity, and explicitness. In addition, the design should address the issues of consistency, completeness, robustness, and transparency

These terms are commonly defined as follows:

Extensibility: The knowledge base must be regarded as an open ended set of facts and relations. This tends to be true during the acquisition phase as well as during operations. In general, the data structures and access programs must be modular enough to allow modifications and additions without forcing substantial structural revisions.

Explicitness: Because of the incremental knowledge acquisition and growth requirements of an expert system, it is necessary for the expert to determine explicitly what knowledge is present in the base (and by implication what is absent). Thus the representation should maintain an explicit representation of the domain knowledge and the expert's heuristics.

Simplicity: As much as possible the structure of the knowledge base should reflect the expert's view of his domain. It is always possible for the knowledge engineer to act as an interpretive interface between the human expert's terminology and perspective and the knowledge base. In this case, the structure of the knowledge base could be as complex as deemed desirable. However, the interface will always be a barrier and cause problems in both the acquisition and eventual growth phase.

Robustness: Of considerable importance is the ability of the system to operate near the edges of the domain. This attribute is often difficult to test: however, it can be important in many situations. Some cases of the use of the system can be conditioned on imprecise data, or indeed, on conditioned attributes and rules. Representing degrees of precision and certainty is a difficult but important part of the design process. Evaluating the results to develop confidence can be equally agonizing.

Transparency: There is almost always a requirement to maintaina high level of transparency in the design so that the system can explain its actions, and/or request help, etc. This forces a consideration on the design, which tends to argue once again for simplicity.

6. ACCEPTANCE TESTS

6.1 Introduction

The acceptance tests for a knowledge based system contain the usual software validation parts which wil guarantee proper modularity and documentation, but differ significantly because of the inferencing which must agree with the expert rather than a given algorithm. In many cases, it is difficult to arrive at numbers rather than opinions when validating an expert system.

In the following we outline how this system will be validated. This will be done in two parts: a physical check of components, and a logical check of the knowledge based software.

6.2 Physical

The physical portion of the system consists of a computer printer, associated software, and the system builder. The major results of the project will be recorded on a set of master disks containing the diagnostic system.

A physical check list will be prepared for sign-off to include all the deliverables such as Computer, Screen, Mouse, Documentation, Builder, system disks, etc.

6.3 Logical

Logical checks involve both the performance of the system and the means by which the performance is achieved. In many cases, it is possible to achieve the appearance of an expert system response with a classical piece of software.

In terms of a logical check-off, the attributes described in Section 5 can be grouped into performance and architectural tests.

6.4 Performance

The system must solve a set of nine problems designed by the TDC to test the nine hypotheses.

The User interface will be tested by moving through all levels of the solution paths, all help menus and all validity checks.

The report generator will be tested by generating both hard copy and magnetic copy of all case studies.

The maintenance mode will be tested by altering rules and/or inserting new rules. This will also demonstrate the extensibility of the software.

6.5 Architecture

The logical architecture of the system should be validated by reviewing the logical design document and by walking step by step through the execution of a session to demonstrate the alleged modularity of the software.

7. TUTORIAL SESSIONS

The system should contain a facility for allowing trainees to run training sessions using simulated data or results and to follow the reasoning process of the system. In this mode it would be expected that formal reports will not be submitted. In addition records of sessions, which can be modified as part of the training would be useful.

8. SUMMARY

The preceding provides the basic elements of a system to fulfill the expectations of the Users. The next step is the preparation of a logical design of the software system.

The system as described is within the capability of a PC-XT and of several low cost system builders.

As the logical design proceeds, the requirements will be modified to reflect a growing awareness of what is possible, based on the chosen system builder and within the overall financial limits of the contract. elements of a system to fulfill the expectations of the Users. The next step is the preparation of a logical design of the software system.

APPENDIX B: DIAGNOSTIC QUESTIONS

Q1: Is it generally harsh, etc as opposed to clear

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Given that you hear only one undesired modulation, is it ::
:: generally harsh, distorted, unrecognizable, garbled (as opposed ::
:: to clear, normal sound) ?                                   ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q2: Undesired signals accompanied by noise

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Do the undesired signals seem to be modulated with noise or ::
:: accompanied by noise (as opposed to receiver or background ::
:: noise)?                                                    ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q3: Hear a 60 Hertz power line frequency buzzing sound

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Does the interference produce a 60 Hertz (power line frequency) ::
:: sound?                                                     ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q4: Interference rise,fall or drift in,out on selected frequency

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Does the sound of the interfering signal seem to rise and fall, ::
:: or drift in and out on the selected frequency?             ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q5: Interference only occur if more than one interfering signal

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Does the interference only occur if more than one interfering ::
:: signal is present?                                         ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q6: How many modulations can you distinguish

Note: When entering the observed symptoms, the system can not diagnose the problem if there are too many "unsure" responses. Please, attempt to find out the information required for the questions, rather than answering "unsure".

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: How many apparently different modulations (intelligible or ::
:: otherwise) can you distinguish, in addition to the expected one? ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q7: If interfererence is voice ever stops midsentence

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: If the modulation of the interfering signal is recognizable, ::
:: have you ever heard it stop abruptly at an unexpected point?   ::
::                                                            ::
:: e.g. if the signal is voice modulated, has the signal ever ::
:: stopped suddenly in mid- sentence?                 ::              ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q8: How many transmitters are nearby

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: How many transmitters are nearby?                  ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q9: Interference an unmodulated carrier slight whistle

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Is the interference an unmodulated carrier (perhaps just a ::
:: slight whistle) as distinct from a modulated signal (such as ::
:: voice or other distinctly modulated service)?           ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q10: Desired signal present for interference to be noticeable

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Must the desired signal be present for the interference to be ::
:: noticeable?                                                     ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q11: Undesired signals widely separated in frequency

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                            ::
:: Are the undesired signals widely separated in frequency from ::
:: each other? (e.g. by more than approximately 5%)           ::
::                                                            ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q12: Interference affected by weather e.g. wind, rain, etc

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Is the interference affected by weather conditions such as wind, ::
:: rain, etc?                                                       ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q13: Undesired modulation superimposed on desired signal

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Is the undesired modulation superimposed on the desired signal?  ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q14: Intermodulation formulae satisfied by interfering TX

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Can the intermodulation formulae be satisfied by the  suspected  ::
:: interfering transmitter frequencies?                             ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q15: FREQ of interfering TX widely separated from desired signal

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Is the frequency of the interfering transmitter widely separated ::
:: from the desired signal?                                         ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q16: Desired audio level increase or decrease in abrupt steps

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Have you ever observed the  desired  audio  level  increase  or  ::
:: decrease in abrupt steps?                                        ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q17: Background noise rise or fall

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                  ::
:: Have you observed the background noise accompanying the desired  ::
:: signal rise or fall in abrupt steps  (with  little or no  other  ::
:: effects)?                                                        ::
::                                                                  ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q18: Receiver sensitivity below normal

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Do  you notice that the receiver  sensitivity is  below  normal  ::
::  sometimes (or always) with little or no other effects?            ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q19: Abnormal effects e.g. meters or switching circuits

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Are there any abnormal effects in the system,  for example,  in  ::
::  meters or switching circuits, etc?                                ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q20: Volume of interference independent of volume control

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Is the volume of the interference independent of the setting of  ::
::  the volume control?                                               ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q21: Oxidized metal joints near transmitters or receivers

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Are there any oxidized metal joints near  the  transmitters  or  ::
::  the receivers?                                                    ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q22: Other receivers near the affected one

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Are there other receivers nearby the affected one?                ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

Q23: TEXT RSR formulae satisfied by undesired transmitter

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                                      ::
::  Can the receiver spurious response formulae be satisfied by the  ::
::  undesired transmitter frequency?                                  ::
::                                                                      ::
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

APPENDIX C: SUPPORT WEIGHTS OF THE EVIDENCE

		TSE	TI	RR	ER	RI	RCM	RD	RSR	AR
Q1:	YES	9	3	0	5	3	0	0	0	5
	NO	1	6	0	3	6	9	0	9	5
	UNS	0	0	0	0	0	0	0	0	0
Q2:	YES	9	2	0	6	2	0	0	0	0
	NO	2	9	0	3	9	9	0	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q3:	YES	9	0	0	0	0	0	0	0	0
	NO	5	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q4:	YES	9	0	0	4	0	0	0	0	0
	NO	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q5:	YES	0	9	0	9	9	9	0	0	0
	NO	9	0	9	4	0	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q6:	0	4	0	9	0	0	0	9	0	0
	1	9	3	0	3	3	9	0	9	9
	>1	0	9	0	9	9	0	0	0	5
	U	0	0	0	0	0	0	0	0	0
Q7:	YES	0	9	0	9	9	9	0	0	0
	NO	9	3	0	3	3	3	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q8:	0	3	0	9	0	0	0	0	5	0
	1	9	0	9	0	0	9	9	9	9
	>1	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q9:	YES	0	0	9	0	0	0	0	0	0
	NO	9	9	0	9	9	9	0	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q10:	YES	1	1	1	1	1	9	5	0	0
	NO	9	9	9	9	9	0	5	9	9
	UNS	0	0	0	0	0	0	0	0	0

		TSE	TI	RR	ER	RI	RCM	RD	RSR	AR
Q11:	YES	0	3	0	9	3	0	0	0	0
	NO	0	9	0	9	9	0	0	0	0
	UNS	0	0	0	0	0	0	0	0	0
Q12:	YES	0	0	0	9	0	0	0	0	0
	NI	9	9	9	6	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q13:	YES	0	0	0	0	0	9	0	0	0
	NO	9	9	9	9	9	0	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q14:	YES	0	9	0	9	9	0	0	0	0
	NO	9	0	9	0	0	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q15:	YES	3	0	0	9	0	0	0	9	9
	NO	9	0	0	9	0	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q16:	YES	0	0	0	0	0	0	9	0	0
	NO	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q17:	YES	0	0	0	0	0	2	9	0	1
	NO	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q18:	YES	1	1	1	1	1	1	9	2	1
	NO	9	9	9	9	9	9	0	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q19:	YES	0	0	0	0	0	0	0	0	9
	NO	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q20:	YES	0	0	0	0	0	0	0	0	9
	NO	9	9	9	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q21:	YES	0	0	0	9	0	0	0	0	0
	MAYB	0	0	0	6	0	0	0	0	0
	NO	0	0	0	0	0	0	0	0	0
	UNS	0	0	0	0	0	0	0	0	0
Q22:	YES	9	9	9	9	9	9	9	9	9
	NO	9	9	0	9	9	9	9	9	9
	UNS	0	0	0	0	0	0	0	0	0
Q23:	YES	0	0	0	0	0	0	0	9	0
	NO	9	9	9	9	9	9	9	0	9
	UNS	0	0	0	0	0	0	0	0	0

APPENDIX D: CODE
EMIRULES.PRL

```
                 TITLE  Electromagnetic Interference Resolution Expert System DISPLAY

                                  TRANSPORT CANADA

                 FACILITY ENGINEERING AND SYSTEMS DEVELOPMENT BRANCH


                             STANDARDS AND PROCEDURES
                  IDENTIFICATION AND RESOLUTION OF ELECTROMAGNETIC
                           INTERFERENCE IN RADIO SYSTEMS

This system will attempt to diagnose and suggest corrective measures
for Electromagnetic  Interference.  The system can deal  with  nine
possible outcomes, which are as follows:

- Receiver Intermodulation            - Receiver Cross Modulation
- Receiver Desensitization           - External Rectification
- Transmitter Intermodulation          - Audio Rectification
- Receiver Spurious Response            - Receiver Radiation
- Transmitter Spurious Emission

********  PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE***************

                               SYSTEM OVERVIEW

A) The  first action the system performs is to  form a hypothesis set about
the problem through a series of questions (observed symptoms).

B) Second, equipment tests are used to confirm an interference.

C) Third, corrective measures are suggested.

D) This  system can handle different levels  of  expertise in  EMI.

        - If the user already has an idea what the problem is he/she may
           bypass the questions and proceed to the equipment tests.

        - The user may also bypass the tests and proceed to the corrective
           measures if it is known with certainty what the interference is.

The following screen asks the user which starting point to use.
On the following screen press F5 (EXPL) for an explanation of the choices.

     ***************  PRESS F3 (STRT) TO START ******************
!****************************
!Boolean Variables.
! The system assumes all non-declared variables
! to be boolean. This section declares SOME of the ones used
! These must be predeclared because of the flow of the program
! STATE24 - State variable indicating an explanation about the tests has been seen
! STATE23B - State variable indicating user bypassed entering symptoms and has
```

```
OR Cures for AR press F5 for explanation IS Signal Entering Via Coaxial Cable
OR Cures for AR press F5 for explanation IS ... Details Required
OR Cures for AR press F5 for explanation IS Circuit Bypassing
OR Cures for AR press F5 for explanation IS .... Details Required
OR Cures for AR press F5 for explanation IS Equipment Change
OR Cures for AR press F5 for explanation IS ..... Details Required
OR Cures for AR press F5 for explanation IS Physical Separation
OR Cures for AR press F5 for explanation IS ...... Details Required
OR Cures for AR press F5 for explanation IS Shielding
OR Cures for AR press F5 for explanation IS ....... Details Required
OR Cures for AR press F5 for explanation IS Power Reduction
OR Cures for AR press F5 for explanation IS ........ Details Required
OR Cures for AR press F5 for explanation IS Frequency Change
OR Cures for AR press F5 for explanation IS ......... Details Required
OR Cures for AR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN ARCURES

RULE Signal Entering Via Power Cord
IF ARCURES
AND Cures for AR press F5 for explanation IS . Details Required
AND DISPLAY Signal Entering Via Power CordA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Signal Entering via External Wiring
IF ARCURES
AND Cures for AR press F5 for explanation IS .. Details Required
AND DISPLAY Signal Entering via External WiringA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Signal Entering via Coaxial Cable
IF ARCURES
AND Cures for AR press F5 for explanation IS ... Details Required
AND DISPLAY Signal Entering via Coaxial CableA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Circuit Bypassing
IF ARCURES
AND Cures for AR press F5 for explanation IS .... Details Required
AND DISPLAY Circuit BypassingA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Equipment Change
IF ARCURES
AND Cures for AR press F5 for explanation IS ..... Details Required
AND DISPLAY Equipment ChangeA
```

```
RULE Power Reduction
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ..... Details Required
AND DISPLAY Power ReductionREST
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Receiver Desensitization
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ...... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Frequency Change cure
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ....... Details Required
AND DISPLAY Frequency ChangeRRRSR
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE NO RSR CURE
IF RSRCURES
AND Cures for RSR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERSR

RULE RSR CURED
IF RSRCURES
AND Cures for RSR press F5 for explanation IS Filtering
OR Cures for RSR press F5 for explanation IS Alternate Receiver
OR Cures for RSR press F5 for explanation IS Receiver Realignment
OR Cures for RSR press F5 for explanation IS Physical Separation
OR Cures for RSR press F5 for explanation IS Power Reduction
OR Cures for RSR press F5 for explanation IS Receiver Desensitization
OR Cures for RSR press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!************************************************
! Corrective measure rules for AR
!************************************************

RULE cm ar
IF STATERSR
OR NOT STATERSR
AND Bypass tests for Audio Rectification
AND ASK Cures for AR press F5 for explanation
AND Cures for AR press F5 for explanation IS Signal Entering Via Power Cord
OR Cures for AR press F5 for explanation IS . Details Required
OR Cures for AR press F5 for explanation IS Signal Entering Via External Wiring
OR Cures for AR press F5 for explanation IS .. Details Required
```

```
!         indicated interferences to be tested
! ARCURES - Variable indicating all AR corrective measures have been looked at
! num1-9 - Boolean hypothesis set collected from SORT.COM
! STATEAR - Variable indicating all corrective measures have been looked at
! STATE25 - One of the three paths to the determine final hypothesis set block has been
!         completed
! COUNT - In the error checking module, an error rule has been examined
! COUNT5 - In the error checking module, all error rules has been examined
! finishquestions - an observed symptom question has been asked
!****************************
SIMPLEFACT STATE24
AND STATE23B
AND ARCURES
AND num1
AND num2
AND num3
AND num4
AND num5
AND num6
AND num7
AND num8
AND num9
AND STATEAR
AND STATE25
AND COUNT
AND COUNT5
AND finishquestions

!************************
!Object variables - these can have more than two possible values
! the following hold the list of cures for the interferences. They must be
! predeclared because of the flow of the program
!***********************
OBJECT Cures for TSE press F5 for explanation
AND Cures for TI press F5 for explanation
AND Cures for ER press F5 for explanation
AND Cures for RI press F5 for explanation
AND Cures for RR press F5 for explanation
AND Cures for RCM press F5 for explanation
AND Cures for RD press F5 for explanation
AND Cures for RSR press F5 for explanation
AND Cures for AR press F5 for explanation

!***********************
!Numeric variables
! Interferences scores from the acquired observed symptoms section
! Maximum score obtainable for each interference
! Normalized scores from pascal external program SORT.COM
!****************************

NUMERIC TSE
AND TI
AND RR
AND ER
AND RI
AND RCM
AND RD
AND RSR
AND AR
AND MAXTSE
AND MAXTI
AND MAXRR
AND MAXER
AND MAXRI
AND MAXRCM
AND MAXRD
AND MAXRSR
AND MAXAR
AND NORMALTSE
AND NORMALTI
AND NORMALRR
AND NORMALER
AND NORMALRI
AND NORMALRCM
AND NORMALRD
AND NORMALRSR
AND NORMALAR

!******************************
!string variable types
! The sorted top 10% of normalized scores from SORT.COM
! After the final hypothesis set has been determined they are
! changed and redisplayed as the final hypothesis set
!********************************

STRING HIGHEST
AND SECOND
AND THIRD
AND FOURTH
AND FIFTH
AND SIXTH
AND SEVENTH
AND EIGHTH
AND NINETH

!********************************
!Initializes numeric variables
!*******************************

INIT TSE := 0
AND TI := 0
AND RR := 0
AND ER := 0
AND RI := 0
AND RCM := 0
AND RD := 0
AND RSR := 0
AND AR := 0
AND MAXTSE := 0
AND MAXTI := 0
AND MAXRR := 0
AND MAXER := 0
AND MAXRI := 0
AND MAXRCM := 0
AND MAXRD := 0
AND MAXRSR := 0
AND MAXAR := 0

!********************************
!Re-Initializes numeric variables after a cycle command
!*******************************
REINIT TSE := 0
AND TI := 0
AND RR := 0
AND ER := 0
AND RI := 0
AND RCM := 0
AND RD := 0
AND RSR := 0
AND AR := 0
AND MAXTSE := 0
AND MAXTI := 0
AND MAXRR := 0
AND MAXER := 0
AND MAXRI := 0
AND MAXRCM := 0
AND MAXRD := 0
AND MAXRSR := 0
AND MAXAR := 0

!************************
!Allows the user to see part of the goal tree (below) and chose
!some of the goals IF goalselect were turned ON
!*************************************

GOALSELECT OFF

!**************************
!Multi allows the variable to have several possible values
! Variable holding list of suspected interferences to be tested
! Variable holding set of tests to be performed
!***********************

MULTI Which type of interference do you suspect
AND PERFORM THESE TESTS press F5 for explanation

!***************************
!Suppresses the system default conclusion screens at the end of the
!session, in favour of created screens.
!*********************************

SUPPRESS ALL

!********************************
!Exhaustive tells the system to test every rule which concludes
!that variable, not just the first one called.
! STATE23B - Will get list of all interferences to be equipment tested
! STATE25 - all three paths will be checked before determining the final
!          interference set
! COUNT - all error rules will be checked
! COUNT5 - ensures error checking module only cycles once
! finishquestions - all required observed symptoms questions will be asked
!*********************************

EXHAUSTIVE STATE23B
AND STATE25
AND COUNT
AND COUNT5
AND finishquestions
!*************************
!IF the user presses the unknown key the system will ignore that
!variable and continue processing. Although the manual indicates
!the default is to continue it is not.
!****************************************

UNKNOWN CONTINUE

!*****************************
!Below is the seach path for the system. There is one final goal
!and three ways of getting there.
!**************************************

1. CURED

!**********************************************
!**********************************************
!FIGURE 3: Logical Block - Acquire Observed Symptoms
!LOGICAL DESIGN - Section 3.3.1 Start Entering The Observed Symptoms
!**********************************************
!**********************************************

!*****************************************************
!if the user does not know which type of interference and does not wish to
!bypass the questions or the tests
!
!Each rule asks for one answer for one question, then it adds
!a score to that interferences score (TSE, TI, etc). AND it adds
!the correct response score to the MAXscore variable
!
!For the "unsure" response no score is added on
!
!finishquestions is set for each completed question
!STATE6 A B C set which path to follow from the first question
!STATE5 A B set which path to follow from  that question
!*****************************************************

RULE ask question6
IF YOUR STARTING POINT, press F5 for explanation IS Start entering observed symptoms
AND How many modulations can you distinguish IS 0
THEN STATE6
AND TSE:=TSE+4
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+9
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question6A
IF YOUR STARTING POINT, press F5 for explanation IS Start entering observed symptoms
AND How many modulations can you distinguish IS 1
THEN STATE6A
AND TSE:=TSE+9
AND TI:=TI+3
AND RR:=RR+0
AND ER:=ER+3
AND RI:=RI+3
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question6B
IF YOUR STARTING POINT, press F5 for explanation IS Start entering observed symptoms
AND How many modulations can you distinguish IS Greater than 1
THEN STATE6B
AND TSE:=TSE+0
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+5
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9
```

```
RULE ask question6C
IF YOUR STARTING POINT, press F5 for explanation IS Start entering observed symptoms
AND How many modulations can you distinguish IS unsure
THEN STATE6C

RULE ask question1
IF STATE6A
OR STATE6C
AND Is it generally harsh, etc as opposed to clear IS yes
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+3
AND RR:=RR+0
AND ER:=ER+5
AND RI:=RI+3
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+5
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+6
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+5
AND MAXRI:=MAXRI+6
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+5

RULE ask question1A
IF STATE6A
OR STATE6C
AND Is it generally harsh, etc as opposed to clear IS no
THEN finishquestions
AND TSE:=TSE+1
AND TI:=TI+6
AND RR:=RR+0
AND ER:=ER+3
AND RI:=RI+6
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+5
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+6
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+5
AND MAXRI:=MAXRI+6
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+5

RULE ask question1B
IF STATE6A
OR STATE6C
AND Is it generally harsh, etc as opposed to clear IS unsure
```

```
THEN finishquestions

RULE ask question7
IF STATE6B
OR STATE6C
AND If interfererence is voice ever stops midsentence IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question7A
IF STATE6B
OR STATE6C
AND If interfererence is voice ever stops midsentence IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+3
AND RR:=RR+0
AND ER:=ER+3
AND RI:=RI+3
AND RCM:=RCM+3
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question7B
IF STATE6B
OR STATE6C
AND If interfererence is voice ever stops midsentence IS unsure
THEN finishquestions

RULE ask question9
```

```
IF STATE6
OR STATE6C
AND How many modulations can you distinguish IS 0
AND Interference an unmodulated carrier slight whistle IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question9A
IF STATE6
OR STATE6C
AND Interference an unmodulated carrier slight whistle IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question9B
IF STATE6
OR STATE6C
AND Interference an unmodulated carrier slight whistle IS unsure
THEN finishquestions

RULE ask question2
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired signals accompanied by noise IS yes
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+2
AND RR:=RR+0
AND ER:=ER+6
AND RI:=RI+2
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+6
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question2A
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired signals accompanied by noise IS no
THEN finishquestions
AND TSE:=TSE+2
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+3
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+6
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question2B
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired signals accompanied by noise IS unsure
THEN finishquestions

RULE ask question3
IF STATE6A
OR STATE6B
OR STATE6C
AND Hear a 60 Hertz power line frequency buzzing sound IS yes
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question3A
IF STATE6A
OR STATE6B
OR STATE6C
AND Hear a 60 Hertz power line frequency buzzing sound IS no
THEN finishquestions
AND TSE:=TSE+5
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question3B
IF STATE6A
OR STATE6B
OR STATE6C
AND Hear a 60 Hertz power line frequency buzzing sound IS unsure
THEN finishquestions

RULE ask question13
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired modulation superimposed on desired signal IS yes
```

```
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question13A
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired modulation superimposed on desired signal IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question13B
IF STATE6A
OR STATE6B
OR STATE6C
AND Undesired modulation superimposed on desired signal IS unsure
THEN finishquestions

RULE ask question5
IF STATE6A
OR STATE6B
OR STATE6C
OR STATE6
```

```
AND Interference only occur if more than one interfering signal IS yes
THEN STATE5A
AND TSE:=TSE+0
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question5A
IF STATE6A
OR STATE6B
OR STATE6C
OR STATE6
AND Interference only occur if more than one interfering signal IS no
THEN STATE5B
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+4
AND RI:=RI+0
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question5B
IF STATE6A
OR STATE6B
OR STATE6C
OR STATE6
AND Interference only occur if more than one interfering signal IS unsure
THEN STATE5C

RULE ask question15
IF STATE5B
```

```
OR STATE5C
AND FREQ of interfering TX widely separated from desired signal IS yes
THEN finishquestions
AND TSE:=TSE+3
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+0
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+0
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question15A
IF STATE5B
OR STATE5C
AND FREQ of interfering TX widely separated from desired signal IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+0
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+0
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+0
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question15B
IF STATE5B
OR STATE5C
AND FREQ of interfering TX widely separated from desired signal IS unsure
THEN finishquestions

RULE ask question11
IF STATE5A
OR STATE5C
AND Undesired signals widely separated in frequency IS yes
THEN finishquestions
```

```
AND TSE:=TSE+0
AND TI:=TI+3
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+3
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+0
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+0
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+0
AND MAXAR:=MAXAR+0

RULE ask question11A
IF STATE5A
OR STATE5C
AND Undesired signals widely separated in frequency IS no
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+0
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+0
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+0
AND MAXAR:=MAXAR+0

RULE ask question11B
IF STATE5A
OR STATE5C
AND Undesired signals widely separated in frequency IS unsure
THEN finishquestions

RULE ask question8
IF STATE5A
OR STATE5B
OR STATE5C
AND How many transmitters are nearby IS 0
THEN finishquestions
AND TSE:=TSE+3
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+5
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question8A
IF STATE5A
OR STATE5B
OR STATE5C
AND How many transmitters are nearby IS 1
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question8B
IF STATE5A
OR STATE5B
OR STATE5C
AND How many transmitters are nearby IS Greater than 1
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question8C
IF STATE5A
OR STATE5B
OR STATE5C
AND How many transmitters are nearby IS unsure
THEN finishquestions

RULE ask question4
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference rise,fall or drift in,out on selected frequency IS yes
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+4
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question4A
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference rise,fall or drift in,out on selected frequency IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question4B
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference rise,fall or drift in,out on selected frequency IS unsure
THEN finishquestions

RULE ask question10
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired signal present for interference to be noticeable IS yes
THEN finishquestions
AND TSE:=TSE+1
AND TI:=TI+1
AND RR:=RR+1
AND ER:=ER+1
AND RI:=RI+1
AND RCM:=RCM+9
AND RD:=RD+5
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+5
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question10A
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired signal present for interference to be noticeable IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+5
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+5
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question10B
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired signal present for interference to be noticeable IS unsure
THEN finishquestions

RULE ask question12
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference affected by weather e.g. wind, rain, etc IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question12A
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference affected by weather e.g. wind, rain, etc IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+6
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question12B
IF STATE5A
OR STATE5B
OR STATE5C
AND Interference affected by weather e.g. wind, rain, etc IS unsure
THEN finishquestions

RULE ask question14
IF STATE5A
OR STATE5B
OR STATE5C
AND Intermodulation formulae satisfied by interfering TX IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question14A
IF STATE5A
OR STATE5B
OR STATE5C
AND Intermodulation formulae satisfied by interfering TX IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+0
AND RR:=RR+9
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question14B
IF STATE5A
OR STATE5B
OR STATE5C
AND Intermodulation formulae satisfied by interfering TX IS unsure
THEN finishquestions

RULE state16
ACTIVATE C:\EMIA\EMIB\IMP.COM
IF STATE5A
OR STATE5B
OR STATE5C
AND Intermodulation formulae satisfied by interfering TX IS Do Intermod Calculations
THEN STATE16

RULE ask question14C
IF STATE5A
OR STATE5B
OR STATE5C
AND Intermodulation formulae satisfied by interfering TX IS Do Intermod Calculations
AND STATE16
THEN finishquestions
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET finishquestions
AND CYCLE

RULE ask question16
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired audio level increase or decrease in abrupt steps IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+9
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question16A
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired audio level increase or decrease in abrupt steps IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question16B
IF STATE5A
OR STATE5B
OR STATE5C
AND Desired audio level increase or decrease in abrupt steps IS unsure
THEN finishquestions

RULE ask question17
IF STATE5A
OR STATE5B
OR STATE5C
AND Background noise rise or fall IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+2
AND RD:=RD+9
AND RSR:=RSR+0
AND AR:=AR+1
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question17A
IF STATE5A
OR STATE5B
OR STATE5C
AND Background noise rise or fall IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question17B
IF STATE5A
OR STATE5B
OR STATE5C
AND Background noise rise or fall IS unsure
THEN finishquestions

RULE ask question18
IF STATE5A
OR STATE5B
OR STATE5C
AND Receiver sensitivity below normal IS yes
THEN finishquestions
AND TSE:=TSE+1
AND TI:=TI+1
AND RR:=RR+1
AND ER:=ER+1
AND RI:=RI+1
AND RCM:=RCM+1
AND RD:=RD+9
AND RSR:=RSR+2
AND AR:=AR+1
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question18A
IF STATE5A
OR STATE5B
OR STATE5C
AND Receiver sensitivity below normal IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question18B
IF STATE5A
OR STATE5B
OR STATE5C
AND Receiver sensitivity below normal IS unsure
THEN finishquestions

RULE ask question19
IF STATE5A
OR STATE5B
OR STATE5C
AND Abnormal effects e.g. meters or switching circuits IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question19A
IF STATE5A
OR STATE5B
OR STATE5C
AND Abnormal effects e.g. meters or switching circuits IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question19B
IF STATE5A
OR STATE5B
OR STATE5C
AND Abnormal effects e.g. meters or switching circuits IS unsure
THEN finishquestions

RULE ask question20
IF STATE5A
OR STATE5B
OR STATE5C
AND Volume of interference independent of volume control IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question20A
IF STATE5A
OR STATE5B
OR STATE5C
AND Volume of interference independent of volume control IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question20B
IF STATE5A
OR STATE5B
OR STATE5C
AND Volume of interference independent of volume control IS unsure
THEN finishquestions

RULE ask question21
IF STATE5A
OR STATE5B
OR STATE5C
AND Oxidized metal joints near transmitters or receivers IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
```

```
RULE ask question21A
IF STATE5A
OR STATE5B
OR STATE5C
AND Oxidized metal joints near transmitters or receivers IS possibly
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+6
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+0
AND MAXTI:=MAXTI+0
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+0
AND MAXRCM:=MAXRCM+0
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+0
AND MAXAR:=MAXAR+0

RULE ask question21B
IF STATE5A
OR STATE5B
OR STATE5C
AND Oxidized metal joints near transmitters or receivers IS no
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+0
AND AR:=AR+0
AND MAXTSE:=MAXTSE+0
AND MAXTI:=MAXTI+0
AND MAXRR:=MAXRR+0
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+0
AND MAXRCM:=MAXRCM+0
AND MAXRD:=MAXRD+0
AND MAXRSR:=MAXRSR+0
AND MAXAR:=MAXAR+0

RULE ask question21C
IF STATE5A
OR STATE5B
OR STATE5C
AND Oxidized metal joints near transmitters or receivers IS unsure
THEN finishquestions
```

```
RULE ask question22
IF STATE5A
OR STATE5B
OR STATE5C
AND Other receivers near the affected one IS yes
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question22A
IF STATE5A
OR STATE5B
OR STATE5C
AND Other receivers near the affected one IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+0
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+9
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question22B
IF STATE5A
OR STATE5B
OR STATE5C
AND Other receivers near the affected one IS unsure
THEN finishquestions
```

```
RULE ask question23
IF STATE5A
OR STATE5B
OR STATE5C
AND RSR formulae satisfied by undesired transmitter IS yes
THEN finishquestions
AND TSE:=TSE+0
AND TI:=TI+0
AND RR:=RR+0
AND ER:=ER+0
AND RI:=RI+0
AND RCM:=RCM+0
AND RD:=RD+0
AND RSR:=RSR+9
AND AR:=AR+0
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question23A
IF STATE5A
OR STATE5B
OR STATE5C
AND RSR formulae satisfied by undesired transmitter IS no
THEN finishquestions
AND TSE:=TSE+9
AND TI:=TI+9
AND RR:=RR+9
AND ER:=ER+9
AND RI:=RI+9
AND RCM:=RCM+9
AND RD:=RD+9
AND RSR:=RSR+0
AND AR:=AR+9
AND MAXTSE:=MAXTSE+9
AND MAXTI:=MAXTI+9
AND MAXRR:=MAXRR+9
AND MAXER:=MAXER+9
AND MAXRI:=MAXRI+9
AND MAXRCM:=MAXRCM+9
AND MAXRD:=MAXRD+9
AND MAXRSR:=MAXRSR+9
AND MAXAR:=MAXAR+9

RULE ask question23B
IF STATE5A
OR STATE5B
OR STATE5C
AND RSR formulae satisfied by undesired transmitter IS unsure
```

```
THEN finishquestions

!******************************************************
!******************************************************
!FIGURE 3: Bypass entering the Observed Symptoms and do the Tests
!LOGICAL DESIGN: Section 3.3.2: Proceed to the Equipment Tests
!******************************************************
!******************************************************

!**************************************************************
!if the user wishes to indicate the list of interferences to be tested
!and bypass the questions
!
!STATE23B - shows this path has been completed
!The rule asks what type of interference is suspected sets the scores including
!interferences with similiar observations
!The max scores are set at 100
!*************************************************************

RULE if suspect Transmitter Spurious Emission
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND ASK Which type of interference do you suspect
AND Which type of interference do you suspect IS Transmitter Spurious Emission
THEN STATE23B
AND TSE:= 75
AND TI:= 70
AND ER:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Transmitter Intermodualtion
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Transmitter Intermodulation
THEN STATE23B
AND TI:= 75
AND RI:=70
AND ER:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Receiver Radiation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
```

```
AND Which type of interference do you suspect IS Receiver Radiation
THEN STATE23B
AND RR:=75
AND TSE:= 70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect External Rectification
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS External Rectification
THEN STATE23B
AND ER:=75
AND RI:=70
AND TI:=70
AND RCM:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Receiver Intermodulation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Receiver Intermodulation
THEN STATE23B
AND RI:=75
AND TI:=70
AND ER:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Receiver Cross Modulation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Receiver Cross Modulation
THEN STATE23B
AND RCM:=75
AND ER:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Receiver Desensitization
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Receiver Desensitization
THEN STATE23B
AND RD:=75
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Receiver Spurious Response
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Receiver Spurious Response
THEN STATE23B
AND RSR:=75
AND AR:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

RULE if suspect Audio Rectification
IF YOUR STARTING POINT, press F5 for explanation IS Proceed to the equipment tests
AND Which type of interference do you suspect IS Audio Rectification
THEN STATE23B
AND AR:=75
AND RSR:=70
AND MAXTSE:=100
AND MAXTI:=100
AND MAXRR:=100
AND MAXER:=100
AND MAXRI:=100
AND MAXRCM:=100
AND MAXRD:=100
AND MAXRSR:=100
AND MAXAR:=100

!**************************************************
!**************************************************
```

```
!FIGURE 3: Bypass entering the Observed Symptoms and the Tests
!        proceed to the Corrective Measures
!LOGICAL DESIGN: Section 3.3.3 - Proceed Directly to the Corrective Measures
!**************************************************
!**************************************************

!**********************************************************
!if the user wishes to indicate one interference and bypass the questions
!and the tests, the user must be 100% of the cause of the problem
!
! STATE25 - indicates the final interference set is complete
! All other interference are excluded from the set
! QTDISAGREE - variable which says the questions and tests disagree is
! set as false
!**********************************************************

RULE to skip the tests for Transmitter Spurious Emission
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Transmitter Spurious Emission
THEN Bypass tests for Transmitter Spurious Emission
AND STATE25
AND NOT Bypass tests for Transmitter Intermodulation
AND NOT Bypass tests for Receiver Radiation
AND NOT Bypass tests for External Rectification
AND NOT Bypass tests for Receiver Intermodulation
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Transmitter Intermodulation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Transmitter Intermodulation
THEN Bypass tests for Transmitter Intermodulation
AND STATE25
AND NOT Bypass tests for Receiver Radiation
AND NOT Bypass tests for External Rectification
AND NOT Bypass tests for Receiver Intermodulation
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Receiver Radiation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Receiver Radiation
THEN Bypass tests for Receiver Radiation
AND STATE25
AND NOT Bypass tests for External Rectification
AND NOT Bypass tests for Receiver Intermodulation
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE
```

```
RULE to skip the tests for External Rectification
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS External Rectification
THEN Bypass tests for External Rectification
AND STATE25
AND NOT Bypass tests for Receiver Intermodulation
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Receiver Intermodulation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Receiver Intermodulation
THEN Bypass tests for Receiver Intermodulation
AND STATE25
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Receiver Cross Modulation
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Receiver Cross Modulation
THEN Bypass tests for Receiver Cross Modulation
AND STATE25
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Receiver Desensitization
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Receiver Desensitization
THEN Bypass tests for Receiver Desensitization
AND STATE25
AND NOT Bypass tests for Receiver Spurious Response
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Receiver Spurious Response
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Receiver Spurious Response
THEN Bypass tests for Receiver Spurious Response
AND STATE25
AND NOT Bypass tests for Audio Rectification
AND NOT QTDISAGREE

RULE to skip the tests for Audio Rectification
IF YOUR STARTING POINT, press F5 for explanation IS Proceed directly to the corrective measures
AND Which type of interference do you suspect? IS Audio Rectification
THEN Bypass tests for Audio Rectification
AND STATE25
AND NOT QTDISAGREE
```

```
!************************************************
!************************************************
!FIGURE 3: Logical Block - Determine Hypothesis and Obtain Test Results
!LOGICAL DESIGN: Section 3.3.5 - Determine Hypothesis
!************************************************
!************************************************

!*************************************************
!if answered the questions or indicated the list of interferences
!to be tested then determine the hypothesis set.
!Go to SORT.PAS with the scores and the maximum scores
!and bring back the boolean hypothesis set, the descending order set and
!the normalized scores.
!Upon returning display screen of hypothesis set
!Hypothesisset - indicates this module has been completed
!**************************************************

RULE determine the hypothesis set
ACTIVATE c:\emia\emib\sort.com
SEND TSE
SEND TI
SEND RR
SEND ER
SEND RI
SEND RCM
SEND RD
SEND RSR
SEND AR
SEND MAXTSE
SEND MAXTI
SEND MAXRR
SEND MAXER
SEND MAXRI
SEND MAXRCM
SEND MAXRD
SEND MAXRSR
SEND MAXAR
RETURN num1
RETURN num2
RETURN num3
RETURN num4
RETURN num5
RETURN num6
RETURN num7
RETURN num8
RETURN num9
RETURN HIGHEST
RETURN SECOND
RETURN THIRD
RETURN FOURTH
RETURN FIFTH
RETURN SIXTH
RETURN SEVENTH
RETURN EIGHTH
RETURN NINETH
RETURN NORMALTSE
```

```
!************************************************
! When viewing the test menu in the above rule the user can indicate
! to view the text of a test. The following rules display each text and cycles
! back to the above rule.
!************************************************

RULE show test1
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS .          DETAILS REQUIRED
AND DISPLAY TEST1
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE

RULE show test2
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS ..          DETAILS REQUIRED
AND DISPLAY TEST2
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE

RULE show test3
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS ...    DETAILS REQUIRED
AND DISPLAY TEST3
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE

RULE show test4
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS ....        DETAILS REQUIRED
AND DISPLAY TEST4
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE

RULE show test5
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS .....            DETAILS REQUIRED..........Pg 2 of 3
AND DISPLAY TEST5
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE
```

```
RULE show test6
IF  Testscollected
AND PERFORM THESE TESTS press F5 for explanation IS ......        DETAILS REQUIRED
AND DISPLAY TEST6
THEN STATE24
AND FORGET STATE24
AND FORGET PERFORM THESE TESTS press F5 for explanation
AND FORGET Testscollected
AND CYCLE

!***********************************************
!After the tests have been collected each intereference is checked to see
! if it can be put in the final hypothesis set
! The final intereference set is entered into the string variables
!************************************************
RULE Bypass Tests for Transmitter Spurious Emission
IF STATE24
OR Testscollected
AND num1
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @  FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ...    Result negative....................Pg 1 of 3
OR PERFORM THESE TESTS press F5 for explanation IS ...    Cannot test; Interfering Signal WEAK
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ....      Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS .....            Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS ......       Cannot test; test meaningless or inappropriate
OR PERFORM THESE TESTS press F5 for explanation IS ......      Cannot test; transmitter frequency unknown..Pg 3
of 3
THEN Bypass tests for Transmitter Spurious Emission
AND HIGHEST := _ Transmitter Spurious Emission
ELSE HIGHEST :=  .

RULE Bypass tests for Transmitter Intermodulation
IF  Bypass tests for Transmitter Spurious Emission
OR Testscollected
AND num2
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @  FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ...    Result negative....................Pg 1 of 3
OR PERFORM THESE TESTS press F5 for explanation IS ...    Cannot test; Interfering Signal WEAK
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ....      Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ....            Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS BR ON TX1 @  FTX2 .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ......      Cannot test; transmitter frequency unknown..Pg 3
of 3
OR PERFORM THESE TESTS press F5 for explanation IS ......       Cannot test; test meaningless or inappropriate
THEN Bypass tests for Transmitter Intermodulation
AND SECOND := _ Transmitter Intermodulation
ELSE SECOND :=  .

RULE Bypass tests for RR
IF Bypass tests for Transmitter Intermodulation
```

```
RETURN NORMALTI
RETURN NORMALRR
RETURN NORMALER
RETURN NORMALRI
RETURN NORMALRCM
RETURN NORMALRD
RETURN NORMALRSR
RETURN NORMALAR
IF finishquestions
OR STATE23B
AND DISPLAY starttests
THEN Hypothesisset

!***********************************************
!***********************************************
!FIGURE 3: Logical Block - Analysis Test Results
!LOGICAL DESIGN: Section 3.3.6 - Analyze Results
!***********************************************
!***********************************************

!***********************************************
!Once the hypothesis set has been generated from SORT.COM then ask
!the test results
!Testscollected - indicates the tests have been collected
!***********************************************

RULE Ask Tests
IF finishquestions
OR STATE23B
AND Hypothesisset
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @  FRX .. Result positive
OR PERFORM THESE TESTS press F5 for explanation IS .          Result negative
OR PERFORM THESE TESTS press F5 for explanation IS .          DETAILS REQUIRED
OR PERFORM THESE TESTS press F5 for explanation IS BR ON RX @  FRX .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ..         Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ..         DETAILS REQUIRED
OR PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ...     Result negative.....................Pg 1 of 3
OR PERFORM THESE TESTS press F5 for explanation IS ...     Cannot test; Interfering Signal WEAK
OR PERFORM THESE TESTS press F5 for explanation IS ...     DETAILS REQUIRED
OR PERFORM THESE TESTS press F5 for explanation IS BR ON RX @  FTX .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ....       DETAILS REQUIRED
OR PERFORM THESE TESTS press F5 for explanation IS ....       Cannot test; test meaningless or inappropriate
OR PERFORM THESE TESTS press F5 for explanation IS ....       Cannot test; transmitter frequency unknown
OR PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS .....                Result negative
OR PERFORM THESE TESTS press F5 for explanation IS .....                DETAILS REQUIRED..........Pg 2 of 3
OR PERFORM THESE TESTS press F5 for explanation IS .....            Cannot test; test meaningless or inappropriate
OR PERFORM THESE TESTS press F5 for explanation IS .....             Cannot test; transmitter frequency unknown
OR PERFORM THESE TESTS press F5 for explanation IS BR ON TX1 @  FTX2 .. Result Positive
OR PERFORM THESE TESTS press F5 for explanation IS ......        Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ......        DETAILS REQUIRED
OR PERFORM THESE TESTS press F5 for explanation IS ......        Cannot test; test meaningless or inappropriate
OR PERFORM THESE TESTS press F5 for explanation IS ......       Cannot test; transmitter frequency unknown..Pg 3
of 3
THEN Testscollected
```

```
RULE Bypass tests for Audio Rectification
IF Bypass tests for Receiver Spurious Response
OR Testscollected
AND num9
AND PERFORM THESE TESTS press F5 for explanation IS .        Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ..        Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ...    Result negative....................Pg 1 of 3
OR PERFORM THESE TESTS press F5 for explanation IS ...    Cannot test; Interfering Signal WEAK
AND PERFORM THESE TESTS press F5 for explanation IS ....        Result negative
OR PERFORM THESE TESTS press F5 for explanation IS ....     Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS .....               Result negative
OR PERFORM THESE TESTS press F5 for explanation IS .....          Cannot test; transmitter frequency unknown
AND PERFORM THESE TESTS press F5 for explanation IS ......       Cannot test; test meaningless or inappropriate
OR PERFORM THESE TESTS press F5 for explanation IS ......     Cannot test; transmitter frequency unknown..Pg 3
of 3
THEN Bypass tests for Audio Rectification
AND NINETH := _ Audio Rectification
ELSE NINETH := .

!************************************************
! if no interference is put in the final hypothesis set then the following
! rule activates the error checking module
! IF question and tests agree then display the final interference set
!************************************************
RULE final possibily
IF NOT Bypass tests for Audio Rectification
AND NOT Bypass tests for Transmitter Spurious Emission
AND NOT Bypass tests for Transmitter Intermodulation
AND NOT Bypass tests for Receiver Radiation
AND NOT Bypass tests for External Rectification
AND NOT Bypass tests for Receiver Intermodulation
AND NOT Bypass tests for Receiver Cross Modulation
AND NOT Bypass tests for Receiver Desensitization
AND NOT Bypass tests for Receiver Spurious Response
THEN QTDISAGREE
ELSE STATE32
AND NOT QTDISAGREE
AND DISPLAY FOLLOWING

!************************************************
!************************************************
!************************************************
!FIGURE 3: Logical Block - Corrective Measures
!LOGICAL DESIGN: Section 3.3.7 - Corrective Measures
!************************************************
!************************************************

!************************************************
!Each interference has its own set of rules to display the text of the
!corrective measures
! The first rule displays the corrective measures
! The following rules display the text of the corrective measures if needed
! The second last rule handles the situation if no corrective measure
! is right and to continue either to the next interference or to finish
! The last rule handles if a corrective measure succeeded
! This section is entered either from Section 3.3.5 or 3.3.6
!***********************************************

!***********************************************
! Corrective measure rules for TSE
!***********************************************
RULE cm tse
IF Bypass tests for Transmitter Spurious Emission
AND STATE25
OR STATE32
AND ASK Cures for TSE press F5 for explanation
AND Cures for TSE press F5 for explanation IS Transmitter Repair or Adjustment
OR Cures for TSE press F5 for explanation IS . Details Required
OR Cures for TSE press F5 for explanation IS Filtering
OR Cures for TSE press F5 for explanation IS .. Details Required
OR Cures for TSE press F5 for explanation IS Physical Separation
OR Cures for TSE press F5 for explanation IS ... Details Required
OR Cures for TSE press F5 for explanation IS Frequency Change
OR Cures for TSE press F5 for explanation IS .... Details Required
OR Cures for TSE press F5 for explanation IS Power Reduction
OR Cures for TSE press F5 for explanation IS ..... Details Required
OR Cures for TSE press F5 for explanation IS Receiver Desensitization
OR Cures for TSE press F5 for explanation IS ...... Details Required
OR Cures for TSE press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN TSECURES

RULE Transmitter Repair or Adjustment cure
IF TSECURES
AND Cures for TSE press F5 for explanation IS . Details Required
AND DISPLAY Transmitter Repair or AdjustmentTSE
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE Filtering
IF TSECURES
AND Cures for TSE press F5 for explanation IS .. Details Required
AND DISPLAY FilteringTSE
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE Physical Separation cure
IF TSECURES
AND Cures for TSE press F5 for explanation IS ... Details Required
AND DISPLAY Physical SeparationA
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE Frequency Change cure
IF TSECURES
AND Cures for TSE press F5 for explanation IS .... Details Required
AND DISPLAY Frequency ChangeTSE
```

```
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE Power Reduction
IF TSECURES
AND Cures for TSE press F5 for explanation IS ..... Details Required
AND DISPLAY Power ReductionTSE
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE Receiver Desensitization
IF TSECURES
AND Cures for TSE press F5 for explanation IS ...... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATETSE
AND FORGET STATETSE
AND FORGET TSECURES
AND CYCLE

RULE TSE no Cure
IF TSECURES
AND Cures for TSE press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATETSE

RULE cured
IF TSECURES
AND Cures for TSE press F5 for explanation IS Transmitter Repair or Adjustment
OR Cures for TSE press F5 for explanation IS Filtering
OR Cures for TSE press F5 for explanation IS Physical Separation
OR Cures for TSE press F5 for explanation IS Frequency Change
OR Cures for TSE press F5 for explanation IS Power Reduction
OR Cures for TSE press F5 for explanation IS Receiver Desensitization
THEN STATEAR
ELSE FORGET STATEAR
!************************************************
! Corrective measure rules for TI
!************************************************
RULE cm TI
IF STATETSE
OR NOT STATETSE
AND Bypass tests for Transmitter Intermodulation
AND ASK Cures for TI press F5 for explanation
AND Cures for TI press F5 for explanation IS Physical Separation
OR Cures for TI press F5 for explanation IS . Details Required
OR Cures for TI press F5 for explanation IS Filtering
OR Cures for TI press F5 for explanation IS .. Details Required
OR Cures for TI press F5 for explanation IS Transmitter Adjustment
OR Cures for TI press F5 for explanation IS ... Details Required
OR Cures for TI press F5 for explanation IS Power Reduction
OR Cures for TI press F5 for explanation IS .... Details Required
OR Cures for TI press F5 for explanation IS Receiver Desensitization
OR Cures for TI press F5 for explanation IS ..... Details Required
OR Cures for TI press F5 for explanation IS Transmitter Attenuation
OR Cures for TI press F5 for explanation IS ...... Details Required
OR Cures for TI press F5 for explanation IS Frequency Change
OR Cures for TI press F5 for explanation IS ....... Details Required
OR Cures for TI press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN TICURES

RULE Physical Separation cure
IF TICURES
AND Cures for TI press F5 for explanation IS . Details Required
AND DISPLAY Physical SeparationA
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Filtering
IF TICURES
AND Cures for TI press F5 for explanation IS .. Details Required
AND DISPLAY FilteringTI
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Transmitter Adjustment
IF TICURES
AND Cures for TI press F5 for explanation IS ... Details Required
AND DISPLAY Transmitter AdjustmentTI
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Power Reduction
IF TICURES
AND Cures for TI press F5 for explanation IS .... Details Required
AND DISPLAY Power ReductionTI
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Receiver Desensitization
IF TICURES
AND Cures for TI press F5 for explanation IS ..... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Transmitter Attenuation cure
IF TICURES
AND Cures for TI press F5 for explanation IS ...... Details Required
AND DISPLAY Transmitter AttenuationA
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE Frequency Change cure
IF TICURES
AND Cures for TI press F5 for explanation IS ....... Details Required
AND DISPLAY Frequency ChangeTIERRI
THEN STATETI
AND FORGET STATETI
AND FORGET TICURES
AND CYCLE

RULE NO TI cure
IF TICURES
AND Cures for TI press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATETI

RULE TI CURED
IF TICURES
AND Cures for TI press F5 for explanation IS Physical Separation
OR Cures for TI press F5 for explanation IS Filtering
OR Cures for TI press F5 for explanation IS Transmitter Adjustment
OR Cures for TI press F5 for explanation IS Power Reduction
OR Cures for TI press F5 for explanation IS Receiver Desensitization
OR Cures for TI press F5 for explanation IS Transmitter Attenuation
OR Cures for TI press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!***********************************************
! Corrective measure rules for RR
!***********************************************

RULE cmRR
IF STATETI
OR NOT STATETI
AND Bypass tests for Receiver Radiation
AND ASK Cures for RR press F5 for explanation
AND Cures for RR press F5 for explanation IS Receiver Repair
OR Cures for RR press F5 for explanation IS . Details Required
OR Cures for RR press F5 for explanation IS Receiver Adjustments or Modification
OR Cures for RR press F5 for explanation IS .. Details Required
OR Cures for RR press F5 for explanation IS Receiver Replacement
OR Cures for RR press F5 for explanation IS ... Details Required
OR Cures for RR press F5 for explanation IS Physical Separation
OR Cures for RR press F5 for explanation IS .... Details Required
OR Cures for RR press F5 for explanation IS Frequency Change
OR Cures for RR press F5 for explanation IS .... . Details Required
OR Cures for RR press F5 for explanation IS Receiver Desensitization
OR Cures for RR press F5 for explanation IS ...... Details Required
OR Cures for RR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN RRCURES

RULE Receiver Repairs cure
IF RRCURES
AND Cures for RR press F5 for explanation IS . Details Required
AND DISPLAY Receiver RepairsA
```

```
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE Receiver Adjustments or Modifications
IF RRCURES
AND Cures for RR press F5 for explanation IS .. Details Required
AND DISPLAY Receiver Adjustments or ModificationA
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE Receiver Replacement
IF RRCURES
AND Cures for RR press F5 for explanation IS ... Details Required
AND DISPLAY Receiver ReplacementA
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE Physical Separation cure
IF RRCURES
AND Cures for RR press F5 for explanation IS .... Details Required
AND DISPLAY Physical SeparationA
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE Frequency Change cure
IF RRCURES
AND Cures for RR press F5 for explanation IS ..... Details Required
AND DISPLAY Frequency ChangeRRRSR
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE Receiver Desensization
IF RRCURES
AND Cures for RR press F5 for explanation IS ..... Details Required
AND DISPLAY Receiver DesensitizationB
THEN STATERR
AND FORGET STATERR
AND FORGET RRCURES
AND CYCLE

RULE No rr cure
IF RRCURES
AND Cures for RR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERR

RULE RR CURED
IF RRCURES
```

```
AND Cures for RR press F5 for explanation IS Receiver Repair
OR Cures for RR press F5 for explanation IS Receiver Adjustments or Modification
OR Cures for RR press F5 for explanation IS Receiver Replacement
OR Cures for RR press F5 for explanation IS Physical Separation
OR Cures for RR press F5 for explanation IS Frequency Change
OR Cures for RR press F5 for explanation IS Receiver Desensitization
THEN STATEAR
ELSE FORGET STATEAR
!**********************************************
! Corrective measure rules for ER
!**********************************************

RULE cm er
IF STATERR
OR NOT STATERR
AND Bypass tests for External Rectification
AND ASK Cures for ER press F5 for explanation
AND Cures for ER press F5 for explanation IS Receiver Desensitization
OR Cures for ER press F5 for explanation IS . Details Required
OR Cures for ER press F5 for explanation IS Physical Separation
OR Cures for ER press F5 for explanation IS .. Details Required
OR Cures for ER press F5 for explanation IS Power Reduction
OR Cures for ER press F5 for explanation IS ... Details Required
OR Cures for ER press F5 for explanation IS Bonding and Grounding of Metal
OR Cures for ER press F5 for explanation IS .... Details Required
OR Cures for ER press F5 for explanation IS Filtering or Bypassing
OR Cures for ER press F5 for explanation IS ..... Details Required
OR Cures for ER press F5 for explanation IS Frequency Change
OR Cures for ER press F5 for explanation IS ...... Details Required
OR Cures for ER press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN ERCURES

RULE Receiver Desensization
IF ERCURES
AND Cures for ER press F5 for explanation IS . Details Required
AND DISPLAY Receiver DesensitizationB
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE Physical Separation cure
IF ERCURES
AND Cures for ER press F5 for explanation IS .. Details Required
AND DISPLAY Physical SeparationA
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE Power Reduction
IF ERCURES
AND Cures for ER press F5 for explanation IS ... Details Required
AND DISPLAY Power ReductionREST
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE Bonding and Grounding of Metal
IF ERCURES
AND Cures for ER press F5 for explanation IS .... Details Required
AND DISPLAY Bonding and Grounding of MetalA
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE Filtering or Bypassing
IF ERCURES
AND Cures for ER press F5 for explanation IS ..... Details Required
AND DISPLAY Filtering or BypassingA
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE Frequency Change cure
IF ERCURES
AND Cures for ER press F5 for explanation IS ...... Details Required
AND DISPLAY Frequency ChangeTIERRI
THEN STATEER
AND FORGET STATEER
AND FORGET ERCURES
AND CYCLE

RULE NO ER CURE
IF ERCURES
AND Cures for ER press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATEER

RULE ERCURED
IF ERCURES
AND Cures for ER press F5 for explanation IS Receiver Desensitization
OR Cures for ER press F5 for explanation IS Physical Separation
OR Cures for ER press F5 for explanation IS Power Reduction
OR Cures for ER press F5 for explanation IS Bonding and Grounding of Metal
OR Cures for ER press F5 for explanation IS Filtering or Bypassing
OR Cures for ER press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!**********************************************
! Corrective measure rules for ER
!**********************************************

RULE cm ri
IF STATEER
OR NOT STATEER
AND Bypass tests for Receiver Intermodulation
AND ASK Cures for RI press F5 for explanation
AND Cures for RI press F5 for explanation IS Physical Separation
OR Cures for RI press F5 for explanation IS . Details Required
OR Cures for RI press F5 for explanation IS Filtering
OR Cures for RI press F5 for explanation IS .. Details Required
OR Cures for RI press F5 for explanation IS Power Reduction
OR Cures for RI press F5 for explanation IS ... Details Required
OR Cures for RI press F5 for explanation IS Receiver Desensitization
OR Cures for RI press F5 for explanation IS .... Details Required
OR Cures for RI press F5 for explanation IS Frequency Change
OR Cures for RI press F5 for explanation IS ..... Details Required
OR Cures for RI press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN RICURES

RULE Physical Separation cure
IF RICURES
AND Cures for RI press F5 for explanation IS . Details Required
AND DISPLAY Physical SeparationA
THEN STATERI
AND FORGET STATERI
AND FORGET RICURES
AND CYCLE

RULE Filtering
IF RICURES
AND Cures for RI press F5 for explanation IS .. Details Required
AND DISPLAY FilteringREST
THEN STATERI
AND FORGET STATERI
AND FORGET RICURES
AND CYCLE

RULE Power Reduction
IF RICURES
AND Cures for RI press F5 for explanation IS ... Details Required
AND DISPLAY Power ReductionREST
THEN STATERI
AND FORGET STATERI
AND FORGET RICURES
AND CYCLE

RULE Receiver Desensitization
IF RICURES
AND Cures for RI press F5 for explanation IS .... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATERI
AND FORGET STATERI
AND FORGET RICURES
AND CYCLE

RULE Frequency Change cure
IF RICURES
AND Cures for RI press F5 for explanation IS ..... Details Required
AND DISPLAY Frequency ChangeTIERRI
THEN STATERI
AND FORGET STATERI
AND FORGET RICURES
AND CYCLE

RULE NO RI CURE
IF RICURES
```

```
AND Cures for RI press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERI

RULE RI CURED
IF RICURES
AND Cures for RI press F5 for explanation IS Physical Separation
OR Cures for RI press F5 for explanation IS Filtering
OR Cures for RI press F5 for explanation IS Power Reduction
OR Cures for RI press F5 for explanation IS Receiver Desensitization
OR Cures for RI press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!************************************************
! Corrective measure rules for RCM
!************************************************

RULE cm RCM
IF STATERI
OR NOT STATERI
AND Bypass tests for Receiver Cross Modulation
AND ASK Cures for RCM press F5 for explanation
AND Cures for RCM press F5 for explanation IS Physical Separation
OR Cures for RCM press F5 for explanation IS . Details Required
OR Cures for RCM press F5 for explanation IS Filtering
OR Cures for RCM press F5 for explanation IS .. Details Required
OR Cures for RCM press F5 for explanation IS Power Reduction
OR Cures for RCM press F5 for explanation IS ... Details Required
OR Cures for RCM press F5 for explanation IS Receiver Desensization
OR Cures for RCM press F5 for explanation IS .... Details Required
OR Cures for RCM press F5 for explanation IS Frequency Change
OR Cures for RCM press F5 for explanation IS ..... Details Required
OR Cures for RCM press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN RCMCURES

RULE Physical Separation cure
IF RCMCURES
AND Cures for RCM press F5 for explanation IS . Details Required
AND DISPLAY Physical SeparationA
THEN STATERCM
AND FORGET STATERCM
AND FORGET RCMCURES
AND CYCLE

RULE Filtering
IF RCMCURES
AND Cures for RCM press F5 for explanation IS .. Details Required
AND DISPLAY FilteringREST
THEN STATERCM
AND FORGET STATERCM
AND FORGET RCMCURES
AND CYCLE

RULE Power Reduction
IF RCMCURES
AND Cures for RCM press F5 for explanation IS ... Details Required
AND DISPLAY Power ReductionREST
THEN STATERCM
```

```
AND FORGET STATERCM
AND FORGET RCMCURES
AND CYCLE

RULE Receiver Desensitization
IF RCMCURES
AND Cures for RCM press F5 for explanation IS .... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATERCM
AND FORGET STATERCM
AND FORGET RCMCURES
AND CYCLE

RULE Frequency Change cure
IF RCMCURES
AND Cures for RCM press F5 for explanation IS ..... Details Required
AND DISPLAY Frequency ChangeRCMAR
THEN STATERCM
AND FORGET STATERCM
AND FORGET RCMCURES
AND CYCLE

RULE NO RCM CURE
IF RCMCURES
AND Cures for RCM press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERCM

RULE RCM CURED
IF RCMCURES
AND Cures for RCM press F5 for explanation IS Physical Separation
OR Cures for RCM press F5 for explanation IS Filtering
OR Cures for RCM press F5 for explanation IS Power Reduction
OR Cures for RCM press F5 for explanation IS Receiver Desensization
OR Cures for RCM press F5 for explanation IS Frequency Change
OR Cures for RCM press F5 for explanation IS Physical Separation
OR Cures for RCM press F5 for explanation IS Filtering
OR Cures for RCM press F5 for explanation IS Power Reduction
OR Cures for RCM press F5 for explanation IS Receiver Desensization
OR Cures for RCM press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!************************************************
! Corrective measure rules for RD
!************************************************

RULE cm rd
IF STATERCM
OR NOT STATERCM
AND Bypass tests for Receiver Desensitization
AND ASK Cures for RD press F5 for explanation
AND Cures for RD press F5 for explanation IS Frequency Change
OR Cures for RD press F5 for explanation IS . Details Required
OR Cures for RD press F5 for explanation IS Physical Separation
OR Cures for RD press F5 for explanation IS .. Details Required
OR Cures for RD press F5 for explanation IS Filtering
OR Cures for RD press F5 for explanation IS ... Details Required
OR Cures for RD press F5 for explanation IS Power Reduction
OR Cures for RD press F5 for explanation IS .... Details Required
OR Cures for RD press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN RDCURES

RULE Frequency Change cure
IF RDCURES
AND Cures for RD press F5 for explanation IS . Details Required
AND DISPLAY Frequency ChangeRD
THEN STATERD
AND FORGET STATERD
AND FORGET RDCURES
AND CYCLE

RULE Physical Separation cure
IF RDCURES
AND Cures for RD press F5 for explanation IS .. Details Required
AND DISPLAY Physical SeparationA
THEN STATERD
AND FORGET STATERD
AND FORGET RDCURES
AND CYCLE

RULE Filtering
IF RDCURES
AND Cures for RD press F5 for explanation IS ... Details Required
AND DISPLAY FilteringREST
THEN STATERD
AND FORGET STATERD
AND FORGET RDCURES
AND CYCLE

RULE Power Reduction
IF RDCURES
AND Cures for RD press F5 for explanation IS .... Details Required
AND DISPLAY Power ReductionREST
THEN STATERD
AND FORGET STATERD
AND FORGET RDCURES
AND CYCLE

RULE NO RD CURE
IF RDCURES
AND Cures for RD press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERD

RULE RD CURED
IF RDCURES
AND Cures for RD press F5 for explanation IS Frequency Change
OR Cures for RD press F5 for explanation IS Physical Separation
OR Cures for RD press F5 for explanation IS Filtering
OR Cures for RD press F5 for explanation IS Power Reduction
THEN STATEAR
ELSE FORGET STATEAR
!************************************************
! Corrective measure rules for RSR
!************************************************
```

```
RULE cm rsr
IF STATERD
OR NOT STATERD
AND Bypass tests for Receiver Spurious Response
AND ASK Cures for RSR press F5 for explanation
AND Cures for RSR press F5 for explanation IS Filtering
OR Cures for RSR press F5 for explanation IS . Details Required
OR Cures for RSR press F5 for explanation IS Alternate Receiver
OR Cures for RSR press F5 for explanation IS .. Details Required
OR Cures for RSR press F5 for explanation IS Receiver Realignment
OR Cures for RSR press F5 for explanation IS ... Details Required
OR Cures for RSR press F5 for explanation IS Physical Separation
OR Cures for RSR press F5 for explanation IS .... Details Required
OR Cures for RSR press F5 for explanation IS Power Reduction
OR Cures for RSR press F5 for explanation IS ..... Details Required
OR Cures for RSR press F5 for explanation IS Receiver Desensitization
OR Cures for RSR press F5 for explanation IS ...... Details Required
OR Cures for RSR press F5 for explanation IS Frequency Change
OR Cures for RSR press F5 for explanation IS ....... Details Required
OR Cures for RSR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN RSRCURES

RULE Filtering
IF RSRCURES
AND Cures for RSR press F5 for explanation IS . Details Required
AND DISPLAY FilteringREST
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Alternate Receiver
IF RSRCURES
AND Cures for RSR press F5 for explanation IS .. Details Required
AND DISPLAY Alternate ReceiverA
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Receiver Realignment
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ... Details Required
AND DISPLAY Receiver RealignmentA
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Physical Separation cure
IF RSRCURES
AND Cures for RSR press F5 for explanation IS .... Details Required
AND DISPLAY Physical SeparationA
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE
```

```
RULE Power Reduction
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ..... Details Required
AND DISPLAY Power ReductionREST
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Receiver Desensitization
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ...... Details Required
AND DISPLAY Receiver DesensitizationA
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE Frequency Change cure
IF RSRCURES
AND Cures for RSR press F5 for explanation IS ....... Details Required
AND DISPLAY Frequency ChangeRRRSR
THEN STATERSR
AND FORGET STATERSR
AND FORGET RSRCURES
AND CYCLE

RULE NO RSR CURE
IF RSRCURES
AND Cures for RSR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN STATERSR

RULE RSR CURED
IF RSRCURES
AND Cures for RSR press F5 for explanation IS Filtering
OR Cures for RSR press F5 for explanation IS Alternate Receiver
OR Cures for RSR press F5 for explanation IS Receiver Realignment
OR Cures for RSR press F5 for explanation IS Physical Separation
OR Cures for RSR press F5 for explanation IS Power Reduction
OR Cures for RSR press F5 for explanation IS Receiver Desensitization
OR Cures for RSR press F5 for explanation IS Frequency Change
THEN STATEAR
ELSE FORGET STATEAR
!*************************************************
! Corrective measure rules for AR
!*************************************************

RULE cm ar
IF STATERSR
OR NOT STATERSR
AND Bypass tests for Audio Rectification
AND ASK Cures for AR press F5 for explanation
AND Cures for AR press F5 for explanation IS Signal Entering Via Power Cord
OR Cures for AR press F5 for explanation IS . Details Required
OR Cures for AR press F5 for explanation IS Signal Entering Via External Wiring
OR Cures for AR press F5 for explanation IS .. Details Required
OR Cures for AR press F5 for explanation IS Signal Entering Via Coaxial Cable
OR Cures for AR press F5 for explanation IS ... Details Required
OR Cures for AR press F5 for explanation IS Circuit Bypassing
OR Cures for AR press F5 for explanation IS .... Details Required
OR Cures for AR press F5 for explanation IS Equipment Change
OR Cures for AR press F5 for explanation IS ..... Details Required
OR Cures for AR press F5 for explanation IS Physical Separation
OR Cures for AR press F5 for explanation IS ...... Details Required
OR Cures for AR press F5 for explanation IS Shielding
OR Cures for AR press F5 for explanation IS ....... Details Required
OR Cures for AR press F5 for explanation IS Power Reduction
OR Cures for AR press F5 for explanation IS ........ Details Required
OR Cures for AR press F5 for explanation IS Frequency Change
OR Cures for AR press F5 for explanation IS ......... Details Required
OR Cures for AR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN ARCURES

RULE Signal Entering Via Power Cord
IF ARCURES
AND Cures for AR press F5 for explanation IS . Details Required
AND DISPLAY Signal Entering Via Power CordA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Signal Entering via External Wiring
IF ARCURES
AND Cures for AR press F5 for explanation IS .. Details Required
AND DISPLAY Signal Entering via External WiringA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Signal Entering via Coaxial Cable
IF ARCURES
AND Cures for AR press F5 for explanation IS ... Details Required
AND DISPLAY Signal Entering via Coaxial CableA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Circuit Bypassing
IF ARCURES
AND Cures for AR press F5 for explanation IS .... Details Required
AND DISPLAY Circuit BypassingA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Equipment Change
IF ARCURES
AND Cures for AR press F5 for explanation IS ..... Details Required
AND DISPLAY Equipment ChangeA
```

```
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Physical Separation cure
IF ARCURES
AND Cures for AR press F5 for explanation IS ...... Details Required
AND DISPLAY Physical SeparationA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Shielding
IF ARCURES
AND Cures for AR press F5 for explanation IS ....... Details Required
AND DISPLAY ShieldingA
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Power Reduction
IF ARCURES
AND Cures for AR press F5 for explanation IS ........ Details Required
AND DISPLAY Power ReductionREST
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE Frequency Change cure
IF ARCURES
AND Cures for AR press F5 for explanation IS ......... Details Required
AND DISPLAY Frequency ChangeRCMAR
THEN STATEAR
AND FORGET STATEAR
AND FORGET ARCURES
AND CYCLE

RULE NO AR cure
IF ARCURES
AND Cures for AR press F5 for explanation IS No corrective Measure is Acceptable or Will Work
THEN NOT STATEAR

RULE AR CURED
IF ARCURES
AND Cures for AR press F5 for explanation IS Signal Entering Via Power Cord
OR Cures for AR press F5 for explanation IS Signal Entering Via External Wiring
OR Cures for AR press F5 for explanation IS Signal Entering Via Coaxial Cable
OR Cures for AR press F5 for explanation IS Circuit Bypassing
OR Cures for AR press F5 for explanation IS Equipment Change
OR Cures for AR press F5 for explanation IS Physical Separation
OR Cures for AR press F5 for explanation IS Shielding
OR Cures for AR press F5 for explanation IS Power Reduction
OR Cures for AR press F5 for explanation IS Frequency Change
```

```
THEN STATEAR
ELSE FORGET STATEAR

!**************************************************
!**************************************************
!FIGURE 1: Logical Block 4 - Report Generator
!LOGICAL DESIGN: Final Report
!**************************************************
!**************************************************

!***********************************
!Once the problem is solved the second report is called
!***********************************

RULE activate reports
ACTIVATE c:\emia\emib\report2.com
IF STATEAR
THEN STATE41

!********************************************
!This is done before going to the report generator. If it was not
!a training session then go to the report generator.
!Tell user to mail reports and session.
!***********************************
RULE FINAL3
IF NOT QTDISAGREE
AND COUNT5
AND STATEAR
AND problem solvedtraining IS Proceed to Report Generation.
AND DISPLAY save
AND STATE41
AND DISPLAY mail
THEN CURED
AND DISPLAY Phone Expert

RULE FINAL
IF STATEAR
AND problem solvedtraining IS Proceed to Report Generation.
AND DISPLAY save
AND STATE41
AND DISPLAY mail
THEN CURED

!*****************************************
!This rule is activated before the above. If this was a training
!session then the session is over.
!******************************************

RULE FINAL2
IF STATEAR
AND problem solvedtraining IS This is a training session, therefore exit.
THEN CURED
AND DISPLAY end

!*************************************
! This rule fires if no corrective measure works
!*************************************
```

```
RULE FINAL3
IF NOT QTDISAGREE
AND NOT STATEAR
THEN NOT CURED
AND DISPLAY Phone Expert

!**********************************
!This line links the error checking module and text file into one compiled file.
!*************************************

$ emiscr1.PRL
$ emiscr2.PRL
```

EMIERROR.PRL

```
!**********************************************
!**********************************************
!If the the questions and tests disagree in other words
! the hypothesis set suggested by the questions was not
! confirmed by the tests then this module tries to resolve the situation
!************************************************
!************************************************

!*********************************
!SECTION 1: The first rule finds out if the user answered the questions
!or skipped them. If the "enter observed symptoms" (questions) were skipped
!the system informs the user to try by answering the questions
!**************************************

RULE if skipped questions
IF QTDISAGREE
AND STATE23B
THEN COUNT
AND FORGET COUNT
AND FORGET Testscollected
AND DISPLAY RESTART
AND FORGET YOUR STARTING POINT, press F5 for explanation
AND FORGET STATE23B
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6C
AND FORGET STATE6B
AND FORGET STATE5A
AND FORGET STATE5B
AND FORGET STATE5C
AND FORGET finishquestions
AND FORGET Hypothesisset
AND FORGET Bypass tests for Transmitter Spurious Emission
AND FORGET Bypass tests for Transmitter Intermodulation
AND FORGET Bypass tests for Receiver Radiation
AND FORGET Bypass tests for External Rectification
AND FORGET Bypass tests for Receiver Intermodulation
AND FORGET Bypass tests for Receiver Cross Modulation
AND FORGET Bypass tests for Receiver Desensitization
AND FORGET Bypass tests for Receiver Spurious Response
AND FORGET Bypass tests for Audio Rectification
AND FORGET STATE24
AND FORGET STATE41
AND FORGET STATE32
AND FORGET QTDISAGREE
AND CYCLE

!**********************************************
!SECTION 2: If the observed symptoms had been filled in then this section will
! erase questions answered as unsure
! and check for inconsistent responses
!**********************************************

!**********************************************
```

```
!Step 1: inform the user of the situation
!Step 2: erase questions answered unsure
!************************************************
RULE Is it generally harsh, etc as opposed to clear is unsure
IF QTDISAGREE
AND finishquestions
AND Hypothesisset
AND DISPLAY RETRY
AND Is it generally harsh, etc as opposed to clear IS Unsure
THEN COUNT
AND FORGET Is it generally harsh, etc as opposed to clear

RULE Undesired signals accompanied by noise is unsure
IF QTDISAGREE
AND finishquestions
AND Undesired signals accompanied by noise IS Unsure
THEN COUNT
AND FORGET Undesired signals accompanied by noise

RULE Hear a 60 Hertz power line frequency buzzing sound is unsure
IF QTDISAGREE
AND finishquestions
AND Hear a 60 Hertz power line frequency buzzing sound IS Unsure
THEN COUNT
AND FORGET Hear a 60 Hertz power line frequency buzzing sound

RULE Interference rise,fall or drift in,out on selected frequency is unsure
IF QTDISAGREE
AND finishquestions
AND Interference rise,fall or drift in,out on selected frequency IS Unsure
THEN COUNT
AND FORGET Interference rise,fall or drift in,out on selected frequency

RULE Interference only occur if more than one interfering signal is unsure
IF QTDISAGREE
AND finishquestions
AND Interference only occur if more than one interfering signal IS Unsure
THEN COUNT
AND FORGET Interference only occur if more than one interfering signal

RULE How many modulations can you distinguish is unsure
IF QTDISAGREE
AND finishquestions
AND How many modulations can you distinguish IS Unsure
THEN COUNT
AND FORGET How many modulations can you distinguish

RULE If interference is voice ever stops midsentence is unsure
IF QTDISAGREE
AND finishquestions
AND If interfererence is voice ever stops midsentence IS Unsure
THEN COUNT
AND FORGET If interfererence is voice ever stops midsentence

RULE How many transmitters are nearby is unsure
IF QTDISAGREE
AND finishquestions
AND How many transmitters are nearby IS unsure
THEN COUNT
AND FORGET How many transmitters are nearby

RULE Interference an unmodulated carrier slight whistle is unsure
IF QTDISAGREE
AND finishquestions
AND Interference an unmodulated carrier slight whistle IS Unsure
THEN COUNT
AND FORGET Interference an unmodulated carrier slight whistle

RULE Desired signal present for interference to be noticeable
IF QTDISAGREE
AND finishquestions
AND Desired signal present for interference to be noticeable IS Unsure
THEN COUNT
AND FORGET Desired signal present for interference to be noticeable

RULE Undesired signals widely separated in frequency
IF QTDISAGREE
AND finishquestions
AND Undesired signals widely separated in frequency IS Unsure
THEN COUNT
AND FORGET Undesired signals widely separated in frequency

RULE Interference affected by weather e.g. wind, rain, etc is unsure
IF QTDISAGREE
AND finishquestions
AND Interference affected by weather e.g. wind, rain, etc IS Unsure
THEN COUNT
AND FORGET Interference affected by weather e.g. wind, rain, etc

RULE Undesired modulation superimposed on desired signal is unsure
IF QTDISAGREE
AND finishquestions
AND Undesired modulation superimposed on desired signal IS Unsure
THEN COUNT
AND FORGET Undesired modulation superimposed on desired signal

RULE Intermodulation formulae satisfied by interfering TX is unsure
IF QTDISAGREE
AND finishquestions
AND Intermodulation formulae satisfied by interfering TX IS Unsure
THEN COUNT
AND FORGET Intermodulation formulae satisfied by interfering TX

RULE FREQ of interfering TX widely separated from desired signal is unsure
IF QTDISAGREE
AND finishquestions
AND FREQ of interfering TX widely separated from desired signal IS Unsure
THEN COUNT
AND FORGET FREQ of interfering TX widely separated from desired signal

RULE Desired audio level increase or decrease in abrupt steps is unsure
IF QTDISAGREE
AND finishquestions
AND Desired audio level increase or decrease in abrupt steps IS Unsure
```

```
THEN COUNT
AND FORGET Desired audio level increase or decrease in abrupt steps

RULE Background noise rise or fall is unsure
IF QTDISAGREE
AND finishquestions
AND Background noise rise or fall IS Unsure
THEN COUNT
AND FORGET Background noise rise or fall

RULE Receiver sensitivity below normal is unsure
IF QTDISAGREE
AND finishquestions
AND Receiver sensitivity below normal IS Unsure
THEN COUNT
AND FORGET Receiver sensitivity below normal

RULE Abnormal effects e.g. meters or switching circuits is unsure
IF QTDISAGREE
AND finishquestions
AND Abnormal effects e.g. meters or switching circuits IS Unsure
THEN COUNT
AND FORGET Abnormal effects e.g. meters or switching circuits

RULE Volume of interference independent of volume control is unsure
IF QTDISAGREE
AND finishquestions
AND Volume of interference independent of volume control IS Unsure
THEN COUNT
AND FORGET Volume of interference independent of volume control

RULE Oxidized metal joints near transmitters or receivers is unsure
IF QTDISAGREE
AND finishquestions
AND Oxidized metal joints near transmitters or receivers IS Unsure
THEN COUNT
AND FORGET Oxidized metal joints near transmitters or receivers

RULE Other receivers near the affected one is unsure
IF QTDISAGREE
AND finishquestions
AND Other receivers near the affected one IS Unsure
THEN COUNT
AND FORGET Other receivers near the affected one

RULE RSR formulae satisfied by undesired transmitter is unsure
IF QTDISAGREE
AND finishquestions
AND RSR formulae satisfied by undesired transmitter IS Unsure
THEN COUNT
AND FORGET RSR formulae satisfied by undesired transmitter

!************************************************
!SECTION 3: The following section checks some of the responses for inconsistencies
!for example some responses required other questions
!to be answered in a predicted manner
!************************************************
```

```
RULE Q2
IF QTDISAGREE
AND finishquestions
AND Undesired signals accompanied by noise IS yes
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET Undesired signals accompanied by noise
AND FORGET Interference an unmodulated carrier slight whistle

RULE Q3
IF QTDISAGREE
AND finishquestions
AND Hear a 60 Hertz power line frequency buzzing sound IS yes
AND Undesired signals accompanied by noise IS no
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET Hear a 60 Hertz power line frequency buzzing sound
AND FORGET Undesired signals accompanied by noise
AND FORGET Interference an unmodulated carrier slight whistle

RULE Q4
IF QTDISAGREE
AND finishquestions
AND Interference rise,fall or drift in,out on selected frequency IS yes
AND PERFORM THESE TESTS press F5 for explanation IS ..          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ....            Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
THEN COUNT
AND FORGET Interference rise,fall or drift in,out on selected frequency

RULE Q6
IF QTDISAGREE
AND finishquestions
AND How many modulations can you distinguish IS 0
AND Interference an unmodulated carrier slight whistle IS no
AND Desired audio level increase or decrease in abrupt steps IS no
THEN COUNT
AND FORGET How many modulations can you distinguish
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET Desired audio level increase or decrease in abrupt steps
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C

RULE Q6A
IF QTDISAGREE
AND finishquestions
AND How many modulations can you distinguish IS 0
AND Desired audio level increase or decrease in abrupt steps IS no
OR Background noise rise or fall IS no
OR Receiver sensitivity below normal IS no
OR Abnormal effects e.g. meters or switching circuits IS no
THEN COUNT
```

```
AND FORGET How many modulations can you distinguish
AND FORGET Background noise rise or fall
AND FORGET Receiver sensitivity below normal
AND FORGET Abnormal effects e.g. meters or switching circuits
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C

RULE Q6B
IF QTDISAGREE
AND finishquestions
AND How many modulations can you distinguish IS 1
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET How many modulations can you distinguish
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C

RULE Q6C
IF QTDISAGREE
AND finishquestions
AND How many modulations can you distinguish IS Greater than 1
AND Interference only occur if more than one interfering signal IS no
AND How many transmitters are nearby IS 0
OR  How many transmitters are nearby IS 1
AND Intermodulation formulae satisfied by interfering TX IS no
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET How many modulations can you distinguish
AND FORGET Interference only occur if more than one interfering signal
AND FORGET How many transmitters are nearby
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C
AND FORGET STATE5A
AND FORGET STATE5B
AND FORGET STATE5C

RULE Q5
IF QTDISAGREE
AND finishquestions
AND Interference only occur if more than one interfering signal IS yes
AND How many modulations can you distinguish IS 1
OR How many modulations can you distinguish IS 0
AND How many transmitters are nearby IS 0
OR  How many transmitters are nearby IS 1
AND Intermodulation formulae satisfied by interfering TX IS no
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET Interference only occur if more than one interfering signal
AND FORGET How many modulations can you distinguish
AND FORGET How many transmitters are nearby
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C
AND FORGET STATE5A
AND FORGET STATE5B
AND FORGET STATE5C

RULE Q7
IF QTDISAGREE
AND finishquestions
AND If interfererence is voice ever stops midsentence IS yes
AND Interference only occur if more than one interfering signal IS no
AND How many modulations can you distinguish IS 1
OR How many modulations can you distinguish IS 0
AND How many transmitters are nearby IS 0
OR  How many transmitters are nearby IS 1
AND Intermodulation formulae satisfied by interfering TX IS no
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET interfererence is voice ever stops midsentence
AND FORGET Interference only occur if more than one interfering signal
AND FORGET How many modulations can you distinguish
AND FORGET How many transmitters are nearby
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C
AND FORGET STATE5A
AND FORGET STATE5B
AND FORGET STATE5C

RULE Q9
IF QTDISAGREE
AND finishquestions
AND Interference an unmodulated carrier slight whistle IS yes
AND How many modulations can you distinguish IS 1
OR How many modulations can you distinguish IS Greater then 1
AND  Other receivers near the affected one IS no
AND PERFORM THESE TESTS press F5 for explanation IS ..          Result negative
AND Is it generally harsh, etc as opposed to clear IS yes
AND Undesired signals accompanied by noise IS yes
AND Hear a 60 Hertz power line frequency buzzing sound IS yes
AND If interfererence is voice ever stops midsentence IS yes
AND Intermodulation formulae satisfied by interfering TX IS yes
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
THEN COUNT
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET interfererence is voice ever stops midsentence
AND FORGET How many modulations can you distinguish
AND FORGET Other receivers near the affected one
AND FORGET Is it generally harsh, etc as opposed to clear
AND FORGET Undesired signals accompanied by noise
AND FORGET Hear a 60 Hertz power line frequency buzzing sound
AND FORGET If interfererence is voice ever stops midsentence
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C

RULE Q10
IF QTDISAGREE
AND finishquestions
AND Desired signal present for interference to be noticeable IS yes
AND Undesired modulation superimposed on desired signal IS no
AND PERFORM THESE TESTS press F5 for explanation IS .        Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ..       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ...    Result negative....................Pg 1 of 3
AND PERFORM THESE TESTS press F5 for explanation IS ....     Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Desired signal present for interference to be noticeable
AND FORGET Undesired modulation superimposed on desired signal

RULE Q12
IF QTDISAGREE
AND finishquestions
AND Interference affected by weather e.g. wind, rain, etc IS yes
AND Oxidized metal joints near transmitters or receivers IS no
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON TX1 @  FTX2 .. Result Positive
THEN COUNT
AND FORGET Interference affected by weather e.g. wind, rain, etc
AND FORGET Oxidized metal joints near transmitters or receivers

RULE Q13
IF QTDISAGREE
AND finishquestions
AND Undesired modulation superimposed on desired signal IS yes
AND Desired signal present for interference to be noticeable IS no
AND PERFORM THESE TESTS press F5 for explanation IS .        Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ..       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS ...    Result negative....................Pg 1 of 3
AND PERFORM THESE TESTS press F5 for explanation IS ....     Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Undesired modulation superimposed on desired signal
AND FORGET Desired signal present for interference to be noticeable

RULE Q14
IF QTDISAGREE
AND finishquestions
AND Intermodulation formulae satisfied by interfering TX IS yes
AND Desired signal present for interference to be noticeable IS no
AND How many modulations can you distinguish IS 1
OR How many modulations can you distinguish IS 0
```

```
AND How many transmitters are nearby IS 0
OR  How many transmitters are nearby IS 1
AND Interference an unmodulated carrier slight whistle IS yes
THEN COUNT
AND FORGET Intermodulation formulae satisfied by interfering TX
AND FORGET Desired signal present for interference to be noticeable
AND FORGET How many modulations can you distinguish
AND FORGET How many transmitters are nearby
AND FORGET Interference an unmodulated carrier slight whistle
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C
AND FORGET STATE5A
AND FORGET STATE5B
AND FORGET STATE5C

RULE Q16
IF QTDISAGREE
AND finishquestions
AND Desired audio level increase or decrease in abrupt steps IS yes
AND How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Desired audio level increase or decrease in abrupt steps
AND FORGET How many modulations can you distinguish

RULE Q17
IF QTDISAGREE
AND finishquestions
AND Background noise rise or fall IS yes
AND How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Background noise rise or fall
AND FORGET How many modulations can you distinguish

RULE Q18
IF QTDISAGREE
AND finishquestions
AND Receiver sensitivity below normal IS yes
AND How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Desired audio level increase or decrease in abrupt steps
AND FORGET How many modulations can you distinguish

RULE Q19
IF QTDISAGREE
AND finishquestions
AND Abnormal effects e.g. meters or switching circuits IS yes
AND How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Abnormal effects e.g. meters or switching circuits
AND FORGET How many modulations can you distinguish

RULE Q20
IF QTDISAGREE
AND finishquestions
AND Volume of interference independent of volume control IS yes
AND How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET Volume of interference independent of volume control
AND FORGET How many modulations can you distinguish

RULE Q23
IF QTDISAGREE
AND finishquestions
AND RSR formulae satisfied by undesired transmitter IS yes
AND How many modulations can you distinguish IS Greater than 1
OR How many modulations can you distinguish IS 0
AND PERFORM THESE TESTS press F5 for explanation IS .          Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS RF ATTEN .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS ....       Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BP ON TX @ FTX OR BR ON TX @ FRX .. Result Positive
THEN COUNT
AND FORGET How many modulations can you distinguish
AND FORGET Interference only occur if more than one interfering signal
AND FORGET STATE6
AND FORGET STATE6A
AND FORGET STATE6B
AND FORGET STATE6C

!*************************************
!The following section checks the test Results against other test
!result
!**************************************

RULE for test1
IF QTDISAGREE
AND finishquestions
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS .....        Result negative
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
THEN COUNT

RULE for test2
IF QTDISAGREE
AND finishquestions
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BP ON RX @ FRX .. Result Positive
AND PERFORM THESE TESTS press F5 for explanation IS BR ON RX @ FTX .. Result Positive
THEN COUNT

!************************************************
!STEP 4:after all rules have been tried then retry the responses
!************************************************
RULE correctness cycle
IF QTDISAGREE
AND COUNT
OR NOT COUNT
THEN COUNT5
AND FORGET finishquestions
AND FORGET STATE23B
AND FORGET QTDISAGREE
AND FORGET Hypothesisset
AND FORGET Testscollected
AND FORGET STATE24
AND FORGET Bypass tests for Transmitter Spurious Emission
AND FORGET Bypass tests for Transmitter Intermodulation
AND FORGET Bypass tests for Receiver Radiation
AND FORGET Bypass tests for External Rectification
AND FORGET Bypass tests for Receiver Intermodulation
AND FORGET Bypass tests for Receiver Cross Modulation
AND FORGET Bypass tests for Receiver Desensitization
AND FORGET Bypass tests for Receiver Spurious Response
AND FORGET Bypass tests for Audio Rectification
AND FORGET STATE32
AND FORGET STATE41
AND FORGET STATETSE
AND FORGET STATETI
AND FORGET STATERI
AND FORGET STATEER
AND FORGET STATERR
AND FORGET STATERCM
AND FORGET STATERD
AND FORGET STATERSR
AND FORGET STATEAR
AND FORGET TSECURES
AND FORGET RICURES
AND FORGET TICURES
AND FORGET ERCURES
AND FORGET RRCURES
AND FORGET RCMCURES
AND FORGET RDCURES
AND FORGET RSRCURES
AND FORGET ARCURES
AND DISPLAY checktest
AND ASK PERFORM THESE TESTS press F5 for explanation
AND CYCLE

!***************************************************
!STEP 5: If after cycling the system returns to this module then phone expert
!***************************************************
RULE not cured
IF QTDISAGREE
AND COUNT5
THEN NOT CURED
AND DISPLAY CON
```

EMITEXT.PRL

!***
! SECTION 1: The following are statements to be displayed

DISPLAY starttests

Based on the information you have entered, the
[illegible]
interferences which could be causing the problem.

The possible cause(s) is (are):

[HIGHEST]
[SECOND]
[THIRD]
[FOURTH]
[FIFTH]
[SIXTH]
[SEVENTH]
[EIGHTH]
[NINETH]

We can now proceed to confirm the hypothesis set by performing the equipment tests.

PRESS RETURN/ENTER OR F2 TO BEGIN THE EQUIPMENT TESTS.

EXPAND PERFORM THESE TESTS press F5 for explanation

The results of the following tests are now required to confirm the interferences:

1: Bandpass Filter on Receiver Tuned to Receive Frequency
(BP ON RX @ FRX)
2: Band Reject Filter on Receiver Tuned to Receive Frequency
(BR ON RD @ FRX)
3: Attenuation Test
(RF ATTEN)
4: Band Reject Filter on Receiver Tuned to TX Frequency
(BR ON RX @ FTX)
5: Bandpass Filter or Band Reject Filter on Transmitter or Receiver
(BP ON TX @ FTX OR BR ON TX @ FRX)
6: Band Reject Filter on Transmitter #1 Tuned
to The Frequency of Transmitter #2
(BR ON TX1 @ FTX2)

PRESS F1 OR (PG DN) FOR EXPLANATION ON ENTERING THE TEST RESULTS

EXPLANATION ON ENTERING TEST RESULTS

The system requires the results of the equipment tests.

The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing the tests, line the cursor opposite the explanation option of a test and press return. Then press F4.

[illegible]

STEP 3: Perform the tests.

[illegible]

[illegible]
Note, the (Pg Dn) key is required to continue to other screens.

STEP 5: After all results are entered press F4.

PRESS RETURN TO CONTINUE

DISPLAY following

Based on the test results, the system has now decided on the following set of interferences.

The possible cause(s) is (are):

[HIGHEST]
[SECOND]
[THIRD]
[FOURTH]
[FIFTH]
[SIXTH]
[SEVENTH]
[EIGHTH]
[NINETH]

The following outline each interference(s) corrective measures.

PRESS RETURN/ENTER OR F2 TO BEGIN THE CORRECTIVE MEASURES.

DISPLAY RESTART

```
=================================================================
+                                          +
+   The interferences suggested are not confirmed by the tests.   +
+                                          +
=================================================================
```

There are several possible reasons why the interferences suggested and the tests could have disagreed.

The observed symptom input procedure was bypassed and only the tests were performed. This could mean that the wrong interference(s) were indicated.

The system will now restart with entering the observed symptoms.

PRESS RETURN/ENTER TO DO OBSERVED SYMPTOMS.

DISPLAY RETRY

```
==============================================================
+                                     +
+    The interferences suggested are not confirmed by the tests.    +
-                                     -
```

There are several possible reasons why the interferences suggested
and the tests could have disagreed.

[illegible]
responded with too many "unsure" or incorrect responses for
the system to properly diagnose the problem.
. The session will now ask to reanswer any questions which were
answered "unsure" or not originally asked at all. Then it will
examine the responses for inconsistent responses.
. Finally, it will re-try to determine the problem.
. Note it may re-ask a question more than once if the response
does not appear consistent with other responses.

PRESS RETURN/ENTER TO REDO QUESTIONS ANSWERED "UNSURE"
AND ANSWER QUESTIONS NOT ORIGINALLY ASKED.

DISPLAY CON

```
==============================================================
+                                     +
+    The interferences suggested are not confirmed by the tests.    +
+                                     +
==============================================================
```

There are several possible reasons why the system can not diagnose
the problem.

. The problem could be multiple sourcing which should be
drawn to the attention of the expert.

. If the questions (observed symptoms) and tests have been
answered correctly with all available information, the expert
should be called.

The expert can be reached at:
Transport Canada, Spectrum Management
Section, AANFDD, Place de Ville, Tower C, Ottawa, Ontario
K1A 0N8, (613) 991-6207.

PRESS RETURN/ENTER OR F2 TO END SESSION.

DISPLAY checktest

The system has now finished checking the entered
responses for inconsistencies.

It will now re-try the responses.

When the test results are re-asked.
Please double check the results and re-enter them.

Some observed symptoms questions could re-asked.

```
                        PRESS RETURN/ENTER OR F2 TO CONTINUE.
DISPLAY Phone Expert



                                   Solution unknown.


                               Transport Canada
                               Spectrum Management Section
                               AANFDD
                               Place de Ville, Tower C
                               Ottawa, Ontario
                               K1A 0N8
                               (613) 991-6207

                        PRESS RETURN/ENTER OR F2 TO END SESSION.

                                         OR

                       F1 FOR AN EXPLANATION ON SAVING A SESSION


     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
     N                                          N
     N        Saving the session for later use        N
     N                                          N
     N  Step 1: Press F6 (Why?) key, this presents the options menu.   N
     N  Step 2: Press F7 (Optn) key and the sub menu appears.          N
     N  Step 3: Use the arrow keys to go down to the "Save Session"    N
     N          option and press return.                N
     N  Step 4: The system now presents the listing of the files      N
     N          to save to.                             N
     N  Step 5: Use the arrow keys to move to a file name and          N
     N          press return.                           N
     N                   OR                             N
     N  Step 5: Press F2 (New) key, and enter the new session name.    N
     N  Step 6: Drive A is the normal drive, be sure a formated disk is N
     N          ready in drive A.                       N
     N          Return to the session, by pressing F8 then F8 again.   N
     N                                          N
     N             PRESS F1 OR (PG DN) TO CONTINUE SESSION          N
     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
DISPLAY save



  00000000000000000000000000000000000000000000000000000000000000000000000000
  0                                            0
  0      Please save the present session for later use by the expert.  0
  0                                            0
  0      After this session has been saved, we can now proceed        0
  0      to prepare the final report and print out all the reports.   0
```

```
0                                          0
0                                          0
0          PRESS RETURN TO CONTINUE                    0
            OR                              0

0000000000000000000000000000000000000000000000000000000000000000000000



       NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
       N                                   N
       N       Saving the session for later use        N
       N                                   N
       N  Step 1: Press F6 (Why?) key, this presents the options menu.   N
       N  Step 2: Press F7 (Optn) key and the sub menu appears.     N
       N  Step 3: Use the arrow keys to go down to the "Save Session"   N
       N       option and press return.            N
       N  Step 4: The system now presents the listing of the files     N
       N       to save to.                      N
       N  Step 5: Use the arrow keys to move to a file name and      N
       N       press return.                      N
       N              OR                         N
       N  Step 5: Press F2 (New) key, and enter the new session name.   N
       N  Step 6: Drive A is the normal drive, be sure a formated disk is  N
       N       ready in drive A.                  N
       N       Return to the session, by pressing F8 then F8 again.   N
       N                                   N
       N          PRESS F1 OR (PG DN) TO CONTINUE SESSION          N
       NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
TEXT problem solvedtraining


                                       The problem is solved.



DISPLAY mail

   0000000000000000000000000000000000000000000000000000000000000000000000
   0                                       0
   0  Please mail the reports and the session disk to Transport Canada HQ   0
   0  Note: You may wish to copy the floppy disk to the harddisk for      0
   0       future use.                          0
   0                                       0
   0     Mailing Address: Transport Canada                  0
   0                 Spectrum Management Section            0
   0                 AANFDD                       0
   0                 Place de Ville, Tower C              0
   0                 Ottawa, Ontario                  0
   0                 K1A 0N8                      0
```

```
0                                         0
0          PRESS RETURN/ENTER OR F2 TO END SESSION.          0
0                                         0
0000000000000000000000000000000000000000000000000000000000000000000000



0000000000000000000000000000000000000000000000000000000000000000000000
0                                         0
0          [illegible] in the [illegible]          0

0          PRESS RETURN/ENTER OR F2 TO END SESSION.          0
0                                         0
0000000000000000000000000000000000000000000000000000000000000000000000

!*********************************************
! SECTION 2: The following sections holds the text for each interference
!          and the procedure for the cures screen
!*********************************************
```

EXPAND Cures for TSE press F5 for Explanation

Transmitter Spurious Emission

According to the information entered Transmitter Spurious Emission could be the cause of the interference.

A transmitter spurious emission is a spectrum component radiated by the transmitting station which is not necessary to the operation of the station or the transmittal of information. It is normally any transmitted signal which falls outside of the necessary bandwidth requirements of the transmitter

Such emissions could include transmitter harmonics, final multiplier frequency radiation, radiation of the transmit frequency plus or minus the crystal frequency, the inherent noise sidebands, or any other undesired signal resulting from a transmitter fault or misalignment.

PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE Pg. 1/2

Transmitter Spurious Emission (continued) Pg. 2/2

One should keep in mind that a spurious emission may fall within equipment specifications and regulatory requirements, and yet still be strong enough to cause interference if the transmitter is powerful enough or close enough to a receiver.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing a cure, line the cursor opposite the explanation option of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for TI press F5 for Explanation

Transmitter Intermodulation

According to the information entered Transmitter Intermodulation could be the cause of the interference.

Transmitted intermodulation products which can cause interference to a receiver may be generated as the result of the simultaneous reception of one or more off channel signals at a transmitter if they, along with the transmitter frequency, or any integral multiple of their frequencies (harmonics), combine in such a manner as to produce a signal on the frequency of a nearby receiver. If all signals are present in a non-linear element in the transmitter output circuitry (e.g. transmitter power amplifier stage or faulty antenna combiner), their sum and difference frequencies are generated by heterodyne action. These new frequencies are termed "intermodulation products".

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing
a cure, line the cursor opposite the explanation option
of the cure and press return.
[illegible]

[illegible]
all needed information on cure/corrective measures is obtained.

[illegible]

STEP 4: Enter a successful result by lining the cursor opposite the
appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option
No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for RR press F5 for Explanation

Receiver Radiation

According to the information entered Receiver Radiation could be the cause of the interference.

Receiver radiation is typically the emission from a receiver of local oscillator signals or their harmonics, which may fall on the receive frequency of a nearby receiver, or the same receiver. Less commonly, other internal RF signals may also be radiated. The signals may be radiated from the circuitry, the cabinet, external wiring or through the antenna. They may also be conducted through the power lines or other wiring. This type of interference is usually caused by either poor receiver design, or by defective shielding and/or filtering in the receiver.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing
a cure, line the cursor opposite the explanation option
of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until
all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option
No corrective measure is acceptable or works.

EXPAND Cures for RIM press F5 for Explanation
Receiver Intermodulation

[illegible]
could be the cause of the interference.

Intermodulation interference may occur in a receiver as a result of the simultaneous reception of two or more off channel signals if they or any integral multiple of their frequencies combine in such a manner as to produce the frequency to which the receiver is tuned. If such signals are simultaneously present in a non-linear element in a receiver's input circuitry (e.g. an overdriven RF stage) their sum and difference frequencies are generated by heterodyne action. These new frequencies are termed "intermodulation products".

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing
a cure, line the cursor opposite the explanation option
of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until
all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the
appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option
No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for RCM press F5 for Explanation
Receiver Cross Modulation

According to the information entered Receiver Cross Modulation could be the cause of the interference.

Cross-modulation interference may occur in a receiver as a result of the simultaneous reception of an on channel (desired) signal and an-off channel (undesired) signal if they combine in such a manner as to cause the modulation of the undesired signal to be added to the desired signal. If such signals are simultaneously present in a non-linear element of the receiver input circuitry, [illegible] mixing of the signals

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing a cure, line the cursor opposite the explanation option of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for ER press F5 for Explanation

External Rectification

According to the information entered External Rectification could be the cause of the interference.

External rectification problems occur when high level signals are present in an electrically non-linear junction, in a metal structure, or in electronic equipment external to the radio system. This may cause the signals to mix and re-radiate from the device in the form of intermodulation or cross modulation products or harmonics. Structures may include antenna towers and hardware, rain gutters, wire fences, metal siding or flashing on buildings, electrical wiring, etc. Electronic equipment may include other transmitters or receivers or miscellaneous electronic devices in the area. The non-linearity is usually caused by loose, rusty or oxidized joints in the metal or in case of electronic equipment, by non-linear components in the circuitry. These allow rectification and mixing of any radio signals that may be present.

PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE Pg. 1/2

External Rectification (continued) Pg. 2/2

[illegible] enough. The source may be difficult to pinpoint, but may be found by searching for an area where the field strength increases. The analyzer can be [illegible] more convenient. A [illegible] direction finder could also be used, if available. When a suspected source is found, shaking or tapping the metal structure will usually give confirmation if one monitors the interference at the same time. If electronic equipment is suspected, temporarily disconnecting the antenna or removing the equipment will confirm the cause.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing a cure, line the cursor opposite the explanation option of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for RD press F5 for Explanation

Receiver Desensitization

According to the information entered Receiver Desensitization could be the cause of the interference.

Receiver desensitization is a reduction in RF gain for the desired signal in the receiver which occurs when one or more high power off-channel signals overload the RF amplifier causing it to operate in a non-linear region and/or causing some AGC current to be generated. This can also occur when sideband components of an off channel signal fall on the receiver frequency, forcing a desired signal to overcome these signals and any AGC which may be produced.

[illegible]

[illegible] of the desired signals.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing a cure, line the cursor opposite the explanation option of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for RSR press F5 for Explanation

Receiver Spurious Response

According to the information entered Receiver Spurious Response could be the cause of the interference.

Receiver Spurious Response refers to undesired receiver responses that result from the mixing of the local oscillator signal or its harmonics with an undesired signal or its harmonics to produce a signal on the intermediate frequency of the receiver. It can also refer to a strong signal on the IF frequency reaching the IF stage of the receiver.

This type of interference is primarily due to a deficiency in the receiver design. In some cases, however, a harmonic of an unwanted signal may be generated in the receiver due to overloading.

In this type of interference the interfering signal is often far removed from the desired frequency.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

[illegible]

[illegible]

Note, the (Pg Dn) key is required to continue to other screens.

[illegible]

[illegible] cure/corrective measures is explained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the appropriate cure and press return.

OR

STEP 4: If no suggested cure works or is acceptable. chose the option No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

EXPAND Cures for AR press F5 for Explanation

Audio Rectification

According to the information entered Audio Rectification could be the cause of the interference.

Audio rectification occurs when a receiver (or other electronic equipment) picks up or is affected by a signal to which it should normally be insensitive. It typically (but not necessarily) involves the signal entering the receiver at some point other than the antenna input. The rectification or other adverse affect may occur anywhere in the receiver, including the audio circuitry. The signal can enter the equipment via the power cord, any external wiring or the antenna input, including entry via the outer conductor of the coaxial cable. In a more severe case the signal may penetrate the case and be picked up directly on the printed circuit boards or internal wiring. The signal may be rectified by any non-linear element in the circuitry, and thus added to the desired signals in the receiver.

PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE Pg. 1/3

Audio Rectification (continued) Pg. 2/3

It may also simply result in the overloading of some circuit stages causing improper operation.

Audio Rectification is not that common in two way radio equipment, particularly commercial types. However, it does occur at times where high signals are present. Ancillary audio equipment may be affected more often, or other electronic equipment at a given site.

A process of elimination is required to identify and correct an audio rectification problem. There are many ways the unwanted signal can enter, countless points where the rectification or overloading can occur and a number of ways to correct the problem, depending on the circumstances. Before modifications are made to the equipment, the manufacturer should be consulted.

PRESS PAGE DOWN (PG DN) [illegible]

Audio Rectification (continued) Pg. 3/3

[illegible] the manufacturer may find or have already found a solution to the problem and might make the necessary modifications in some cases.

In any case, the manufacturer can advise on any detrimental effects to the equipment that a proposed modification might have. Modifications may also void any warranty, type approval or certification given the equipment.

PRESS F1 OR (PG DN) TO CONTINUE

EXPLANATION ON USING CURES MENU

The system is presenting the appropriate cures/corrective measures.
The procedure is as follows:

STEP 1: To acquire information about the procedure for implementing
a cure, line the cursor opposite the explanation option
of the cure and press return.
Note, the (Pg Dn) key is required to continue to other screens.

STEP 2: Upon returning to the screen, step 1 may be repeated until
all needed information on cure/corrective measures is obtained.

STEP 3: Perform the cure/corrective measure.

STEP 4: Enter a successful result by lining the cursor opposite the
appropriate cure and press return.
OR
STEP 4: If no suggested cure works or is acceptable. chose the option
No corrective measure is acceptable or works.

PRESS RETURN/ENTER TO RETURN TO THE SESSION

```
!*********************************************
! SECTION 3: The following are the tests 1,2,3,4,5 and ,6
!*********************************************
DISPLAY TEST1
```

```
ɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅɅM
:                                                     :
:  TEST 1: Bandpass Filter on Receiver Tuned to Receive Frequency  :
:                                                     :
                    [illegible]

: Step 1. Tune a cavity bandpass filter to the desired receive   :
:        frequency.                                   :
: Step 2. Install the filter in the receiver antenna feed line.     :
                    [illegible]
: Step 3. Observe the results. If the interference is significantly :
:        reduced or eliminated, this is a positive result. Desired :
:        signals should not be significantly attenuated.          :
:                                                     :
: PRESS F7 TO PRINT THIS TEST OR (PG DN) TO CONTINUE              :
:                                                     :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk
```

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                              N
N          Using a Cavity Bandpass Filter               N
N                                              N
N  This is a tunable filter with a  relatively narrow  passband  and N
N  relatively low  insertion loss.  The  insertion  loss can usually N
N  be varied from 0.5 dB to 3.0 dB. Doing so varies the  selectivity N
N  of the filter, ie: the higher the insertion loss, the sharper the N
N  filter response curve.  The insertion loss is varied by  changing N
N  the size of the internal coupling  loops,  or on  some  models by N
N  rotating  the loops.  The loops  are connected  to the  input and N
N  output connectors.                                  N
N                                              N
N  To tune the filter on a  transmitter,  place the filter in series N
N  in the transmission line  with  a power meter  installed after it N
N  and the antenna connected.  With the transmitter keyed on, adjust N
N  the filter for a maximum  forward power  indication on the meter. N
N                                              N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/4      N
N                                              N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                              N
N        Using a Cavity Bandpass Filter   (continued)  Pg. 2/4      N
N                                              N
N  This technique should be  used cautiously  because until properly N
N  tuned  the  cavity filter  will present  a severe mismatch to the N
N  transmitter.                                     N
N                                              N
N  An alternate method,  and one which  can  be used as a  preceding N
N  step to  the first,  or to tune the filter for use on a receiver, N
N  is  to use a calibrated RF signal generator and spectrum analyzer N
N  or  field  strength  meter.  Set  the  generator  to  the desired N
N  frequency and  tune the  filter  for  a maximum  indication on the N
```

```
N  analyzer or meter.                              N
N                                          N
N                                          N
N                                          N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN



NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                          N
N       Using a Cavity Bandpass Filter   (continued)  Pg. 3/4      N
N                                          N
N  Filter tuning is accomplished by  turning the  tuning knob on top N
N  of the cavity or by moving the tuning rod up or down, by whatever N
N  means is provided. This causes the inner  conductor of the filter N
N  to be  lengthened or  shortened,  thereby  bringing the cavity to N
N  resonance.  When  tuning is  completed,  lock the rod in place to N
N  prevent  accidental  detuning.  Most cavities have a set screw or N
N  lock nut of some sort to do this.                 N
N                                          N
N                                          N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN



NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                          N
N       Using a Cavity Bandpass Filter   (continued)  Pg. 4/4      N
N                                          N
N  When tuning is  completed,  the filter  can be  installed  in the N
N  antenna feed line of either a transmitter or receiver.  It can be N
N  placed  before  or  after other  filters or devices  in the line. N
N  However,  the feed line cannot be shared with  other  frequencies N
N  (eg. other transmitters, receivers or a  duplex  system)  because N
N  the filter is designed to pass only one frequency.        N
N                                          N
N                                          N
N       PRESS RETURN/ENTER TO CONTINUE                  N
N                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
DISPLAY TEST2

      MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      :                                          :
      :  TEST 2: Band Reject Filter on Receiver Tuned to Receive Frequency :
      :                                          :
      :          Please perform the following test             :
      :                                          :
      :  Step 1. Tune a cavity band reject filter to the desired receive   :
      :        frequency                           :
      :  Step 2. Install the filter in the receiver antenna feed line      :
```

```
:        (press F5 for explanation of filter installation)          :
: Step 3. Observe the results. If the interference is significantly  :
:        reduced or eliminated, this is a  positive  result.  Note  :
         that the desired signal will be attenuated also.           :


HNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNk



NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                          N
N          Using a Cavity Band Reject Filter                     N
N                                          N
N  This is a tunable notch filter with a very sharp response curve  N
N  and low insertion loss (typically 0.5 dB or less). It is almost  N
N  identical in construction  to the bandpass  filter, except  the  N
N  output loop and connector are removed, and a "TEE" connector is  N
N  added to the input connecter. The amount of attenuation at  the  N
N  notch  frequency  can  be  varied by  changing  or rotating the  N
N  input loop, depending on the model. Increasing the attenuation,  N
N  however,  causes the  response  curve to become wider,  thereby  N
N  increasing   insertion  loss   at   frequencies near the notch  N
N  frequency.                                  N
N                                          N
N                                          N
N       PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/3          N
N                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                          N
N        Using a Cavity Band Reject Filter   (continued) Pg. 2/3    N
N                                          N
N  To tune the filter,  place it in series via the "TEE"   connector N
N  with a calibrated RF signal generator and a spectrum analyzer  or N
N  field  strength  meter.  Set the generator to the frequency to be N
N  rejected and adjust the filter for a minimum indication on the    N
N  analyzer or meter.                              N
N                                          N
N  Filter  tuning is accomplished by turning the tuning knob on  the N
N  top  of   the   cavity or  moving the  tuning rod  up  or   down, N
N  by whatever means is provided. This causes the inner conductor of N
N  the filter to  be  lengthened or shortened thereby  bringing  the N
N  cavity to  resonance.   When tuning is completed, lock the rod in N
N  place  to  prevent accidental detuning.  Most  cavities  have  a N
N  set screw or lock nut of some sort to do this.             N
N                                          N
N            PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE              N
N                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

```
        N                                              N
        N      Using a Cavity Band Reject Filter   (continued) Pg. 3/3    N
        N                                              N
        N  When tuning is complete, check the insertion loss at the desired N
        N  pass frequency. If the frequencies are close together, this loss N
        N  [illegible]                                                      N
        N  which is the loss of attenuation at the notch frequency.  If the N
        N  insertion loss is acceptable the filter can be installed. Note N
        N  that a high insertion loss means there is a mismatch of N
        N  impedance which could be harmful to a transmitter. The filter N
        N  may be installed in the antenna feed line of either a transmitter N
        N  or receiver. It can be placed before or after other filters or N
        N  devices in the line. The feed line can be shared with other N
        N  frequencies, provided the filter does not present an unacceptable N
        N  insertion loss to any of those frequencies.          N
        N                                              N
        N         PRESS RETURN/ENTER      TO CONTINUE             N
        N                                              N
        NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
DISPLAY TEST3

        MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
        :                                              :
        :            TEST 3: Attenuation Test                   :
        :                                              :
        :             Please Perform the Following Test               :
        :                                              :
        : Note: This test may only be used on a receiver IF the signal :
        : levels can be measured at a point after the early RF stages AND IF :
        : the AGC (Automatic Gain Control) can be disabled OR IF the test :
        : point precedes any AGC action in the receiver. Alternately, the :
        : AGC voltage itself can be measured. This will necessitate :
        : calibrating the AGC voltage versus input signal levels.          :
        :                                              :
        : Step 1. Measure the internal signal level of the interference in :
        :        the receiver.                                 :
        : Step 2. Add a known amount of attenuation in the receiver antenna :
        :        feed line.                                   :
        :                                              :
        :        PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2       :
        HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk

        MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
        :                                              :
        :            TEST 3: Attenuation Test (continued)  Pg. 2/2       :
        :                                              :
        : Step 3. Measure the internal signal level of EMI in the RX again. :                   :
        : Step 4. If the internal signal level has dropped by a larger :
        :        amount than the attenuation, (e.g. 6 dB drop for 3 dB of :
        :        attenuation) then this is a positive result.        :
        : Step 5. If the internal signal level has dropped in equal :
        :        proportion to the attenuation ( eg. 3 dB drop for 3 dB :
        :        of attenuation) then this is a negative result.        :
        :                                              :
        : PRESS F7 TO PRINT THIS TEST OR (PG DN) TO CONTINUE              :
        :                                              :
        HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk
```

```
DISPLAY TEST4
      MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
      :                                      :
      : TEST 4: Band Reject Filter on Receiver Tuned to TX Frequency            :


                                             :
      :  Step 1. Tune a cavity band reject filter to the FREQ. of the TX.  :            :
      :  Step 2. Install the filter in the  receiver  antenna  feed  line.  :
               [illegible]
      :  Step 3. Observe the results. If the interference is significantly  :
      :        reduced or eliminated, then this is a positive result.    :
      :                                      :
      :  PRESS F7 TO PRINT THIS TEST OR (PG DN) TO CONTINUE            :
      HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk








       NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
       N                                   N
       N           Using a Cavity Band Reject Filter            N
       N                                   N
       N  This is a tunable notch filter with a very sharp response curve  N
       N  and low insertion loss (typically 0.5 dB or less). It is almost  N
       N  identical in construction  to the bandpass  filter, except  the  N
       N  output loop and connector are removed, and a "TEE" connector is  N
       N  added to the input connecter. The amount of attenuation at  the  N
       N  notch  frequency  can  be  varied by  changing  or rotating the  N
       N  input loop, depending on the model. Increasing the attenuation,  N
       N  however,  causes the  response  curve to become wider,  thereby  N
       N  increasing   insertion  loss   at   frequencies near the notch  N
       N  frequency.                              N
       N                                   N
       N                                   N
       N           PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/3     N
       N                                   N
       NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


       NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
       N                                   N
       N         Using a Cavity Band Reject Filter   (continued) Pg. 2/3   N
       N                                   N
       N  To tune the filter,  place it in series via the "TEE"   connector N
       N  with a calibrated RF signal generator and a spectrum analyzer  or N
       N  field  strength  meter.  Set the generator to the frequency to be N
       N  rejected and adjust the filter for a minimum indication on the    N
       N  analyzer or meter.                          N
       N                                   N
       N  Filter  tuning is accomplished by turning the tuning knob on  the N
       N  top  of   the   cavity or  moving the  tuning rod  up  or   down, N
```

```
N by whatever means is provided. This causes the inner conductor of N
N the filter to be lengthened or shortened thereby bringing the N
N cavity to resonance. When tuning is completed, lock the rod in N
N place to prevent accidental detuning. Most cavities have a N
N [illegible]                                        N
N                                                    N
N      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                    N
N      Using a Cavity Band Reject Filter  (continued) Pg. 3/3   N
N                                                    N
N When tuning is complete, check the insertion loss at the desired N
N pass frequency. If the frequencies are close together, this loss N
N may be too high. Changing the input loop may improve this, but N
N with some loss of attenuation at the notch frequency. If the N
N insertion loss is acceptable the filter can be installed. Note N
N that a high insertion loss means there is a mismatch of N
N impedance, which might be harmful to a transmitter. The filter N
N may be installed in the antenna feed line of either a transmitter N
N or receiver. It can be placed before or after other filters or N
N devices in the line. The feed line can be shared with other N
N frequencies, provided the filter does not present an unacceptable N
N insertion loss to any of those frequencies.          N
N                                                    N
N          PRESS RETURN/ENTER TO CONTINUE                   N
N                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
DISPLAY TEST5

     MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
     :                                                 :
     :   TEST 5: Bandpass Filter or Band Reject Filter on Transmitter    :
     :                                                 :
     : Note: This test can be used if the transmitters involved in the :
     : interference have been identified and are accessible.        :
     :                                                 :
     : Step 1. Tune a cavity bandpass filter to the frequency of the    :
     :        transmitter in question. OR tune a cavity band reject  :
     :        filter to the desired receive frequency.          :
     : Step 2. Install either filter (or both) in the antenna feed line  :
     :        of the transmitter in question (press f5 for explanations).:
     :                                                 :
     :      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2          :
     HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<




     MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
     :                                                 :
     : TEST 5: Bandpass or Band Reject Filter on TX  (continued) Pg. 2/2  :
     :                                                 :
```

```
: Step 3. Observe the results. If the interference is significantly :
:        reduced or eliminated, then this is a positive result.     :
:                                                          :
: Step 4. If there is more than one transmitter in question, repeat :

  [illegible]
:                                                          :
HKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
```

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                          N
N          Using a Cavity Bandpass Filter                  N
N                                                          N
N This is a tunable filter with a relatively narrow passband and N
N relatively low insertion loss. The insertion loss can usually N
N be varied from 0.5 dB to 3.0 dB. Doing so varies the selectivity N
N of the filter, ie: the higher the insertion loss, the sharper the N
N filter response curve. The insertion loss is varied by changing N
N the size of the internal coupling loops, or on some models by N
N rotating the loops. The loops are connected to the input and N
N output connectors.                                        N
N                                                          N
N To tune the filter on a transmitter, place the filter in series N
N in the transmission line with a power meter installed after it N
N and the antenna connected. With the transmitter keyed on, adjust N
N the filter for a maximum forward power indication on the meter. N
N                                                          N
N        PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE Pg. 1/4      N
N                                                          N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                          N
N       Using a Cavity Bandpass Filter (continued) Pg. 2/4     N
N                                                          N
N This technique should be used cautiously because until properly N
N tuned the cavity filter will present a severe mismatch to the N
N transmitter.                                              N
N                                                          N
N An alternate method, and one which can be used as a preceding N
N step to the first, or to tune the filter for use on a receiver, N
N is to use a calibrated RF signal generator and spectrum analyzer N
N or field strength meter. Set the generator to the desired N
N frequency and tune the filter for a maximum indication on the N
N analyzer or meter.                                         N
N                                                          N
N                                                          N
```

```
N                                                    N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                    N
N       Using a Cavity Bandpass Filter   (continued)  Pg. 3/4      N
N                                                    N
N  Fine tuning is accomplished by turning the tuning knob on top N
N  of the cavity or by moving the tuning rod up or down, by whatever N
N  means is provided. This causes the inner  conductor of the filter N
N  to be  lengthened or  shortened,  thereby  bringing the cavity to N
N  resonance.  When  tuning is  completed,  lock the rod in place to N
N  prevent  accidental  detuning.  Most cavities have a set screw or N
N  lock nut of some sort to do this.                          N
N                                                    N
N                                                    N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                    N
N       Using a Cavity Bandpass Filter   (continued)  Pg. 4/4      N
N                                                    N
N  When tuning is  completed,  the filter  can be  installed  in the N
N  antenna feed line of either a transmitter or receiver.  It can be N
N  placed  before  or  after other  filters or devices  in the line. N
N  However,  the feed line cannot be shared with  other  frequencies N
N  (eg. other transmitters, receivers or a  duplex  system)  because N
N  the filter is designed to pass only one frequency.             N
N                                                    N
N                                                    N
N                                                    N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE          N
N                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                    N
N          Using a Cavity Band Reject Filter                N
N                                                    N
N  This is a tunable notch filter with a very sharp response curve   N
N  and low insertion loss (typically 0.5 dB or less). It is almost   N
N  identical in construction  to the bandpass  filter, except  the   N
```

```
N  output loop and connector are removed, and a "TEE" connector is  N
N  added to the input connecter. The amount of attenuation at  the  N
N  notch  frequency  can  be  varied by  changing  or rotating the  N
N  input loop, depending on the model. Increasing the attenuation.  N
N  [illegible] curve to become wider, thereby  N
                                                       N
                                             N
[illegible]
N                                            N
N                                            N
N        PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE [illegible]          N
                                             N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                            N
N       Using a Cavity Band Reject Filter   (continued) Pg. 2/3   N
N                                            N
N  To tune the filter,  place it in series via the "TEE"   connector N
N  with a calibrated RF signal generator and a spectrum analyzer  or N
N  field  strength  meter.  Set the generator to the frequency to be N
N  rejected and adjust the filter for a minimum indication on the    N
N  analyzer or meter.                                    N
N                                            N
N  Filter  tuning is accomplished by turning the tuning knob on  the N
N  top  of   the   cavity or  moving the  tuning rod  up   or   down, N
N  by whatever means is provided. This causes the inner conductor of N
N  the filter to  be  lengthened or shortened thereby  bringing  the N
N  cavity to  resonance.   When tuning is completed, lock the rod in N
N  place  to  prevent accidental detuning.   Most  cavities  have  a N
N  set screw or lock nut of some sort to do this.            N
N                                            N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE              N
N                                            N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                            N
N       Using a Cavity Band Reject Filter   (continued) Pg. 3/3    N
N                                            N
N  When tuning is complete,  check the insertion loss at the desired N
N  pass frequency.  If the frequencies are close together, this loss N
N  may  be too high.   Changing the input loop may improve this, but N
N  with some loss of  attenuation at the  notch  frequency.   If the N
N  insertion  loss is acceptable the filter can be  installed.  Note N
N  that  a  high  insertion  loss  means  there  is  a  mismatch  of N
N  impedance,  which might be harmful to a transmitter.  The  filter N
N  may be installed in the antenna feed line of either a transmitter N
N  or  receiver.  It can be placed before or after other filters  or N
N  devices  in  the  line.  The feed line can be shared  with  other N
N  frequencies, provided the filter does not present an unacceptable N
N  insertion loss to any of those frequencies.               N
N                                            N
N          PRESS RETURN/ENTER TO CONTINUE                    N
N                                            N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
DISPLAY TEST6
```

```
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                        :
:    TEST 6: Band Reject Filter on Transmitter #1 Tuned         :
        to The Frequency of Transmitter #2                  :

[illegible] or more transmitters are
:      involved, have been identified and are accessible.        :
:                                        :
  Step 1. Tune a cavity band reject filter to the frequency of each
        transmitter other than the one under test.
: Step 2. Install filters one at a time in the antenna feed line of :
:        the transmitter under test.                 :
:        (Press F5 for more information)                :
:                                        :
:      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2          :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk
```

```
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:                                        :
: TEST 6: Band Reject Filter on Transmitter #1   (continued) Pg. 2/2  :
:       Tuned to The Frequency of Transmitter #2                 :
:                                        :
:  Step 3. Observe the results. If the interference is significantly  :
:        reduced or eliminated then this is a positive result.     :
:  Step 4. Repeat this procedure at each of the transmitters involved :
:                                        :
:  PRESS F7 TO PRINT THIS TEST OR (PG DN) TO CONTINUE              :
:                                        :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMk
```

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                        N
N          Using a Cavity Band Reject Filter                 N
N                                        N
N  This is a tunable notch filter with a very sharp response curve  N
N  and low insertion loss (typically 0.5 dB or less). It is almost   N
N  identical in construction  to the bandpass  filter, except  the   N
N  output loop and connector are removed, and a "TEE" connector is   N
N  added to the input connecter. The amount of attenuation at  the   N
N  notch  frequency  can  be  varied by  changing  or rotating the   N
N  input loop, depending on the model. Increasing the attenuation,   N
N  however,  causes the  response  curve to become wider,  thereby   N
```

```
N increasing  insertion loss  at  frequencies near the notch  N
N frequency.                                          N
N                                                     N
N                                                     N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE            N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                     N
N       Using a Cavity Band Reject Filter  (continued) Pg. 2/3  N
N                                                     N
N To tune the filter, place it in series via the "TEE"  connector N
N with a calibrated RF signal generator and a spectrum analyzer or N
N field  strength  meter. Set the generator to the frequency to be N
N rejected and adjust the filter for a minimum indication on the  N
N analyzer or meter.                                   N
N                                                     N
N Filter  tuning is accomplished by turning the tuning knob on  the N
N top  of   the   cavity or  moving the  tuning rod  up  or   down, N
N by whatever means is provided. This causes the inner conductor of N
N the filter to  be  lengthened or shortened thereby  bringing  the N
N cavity to  resonance.  When tuning is completed, lock the rod in N
N place  to  prevent accidental detuning.  Most  cavities  have  a N
N set screw or lock nut of some sort to do this.          N
N                                                     N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE            N
N                                                     N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                     N
N       Using a Cavity Band Reject Filter  (continued) Pg. 3/3  N
N                                                     N
N When tuning is complete,  check the insertion loss at the desired N
N pass frequency.  If the frequencies are close together, this loss N
N may  be too high.  Changing the input loop may improve this, but N
N with some loss of  attenuation at the  notch  frequency.  If the N
N insertion  loss is acceptable the filter can be  installed.  Note N
N that  a  high  insertion  loss  means  there  is  a  mismatch  of N
N impedance,  which might be harmful to a transmitter.  The  filter N
N may be installed in the antenna feed line of either a transmitter N
N or  receiver.  It can be placed before or after other filters  or N
N devices  in  the  line.  The feed line can be shared  with  other N
N frequencies, provided the filter does not present an unacceptable N
N insertion loss to any of those frequencies.           N
N                                                     N
N          PRESS RETURN/ENTER TO CONTINUE               N
N                                                     N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
!*********************************************
! SECTION 4: The following are help statements to be display
! upon using certain observed symptom questions.
! When the user needs more information.
!*********************************************
```

```
EXPAND YOUR STARTING POINT, press F5 for explanation
     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
     N                                      N
     N        Expert System Session Starting Point              N
     N                                      N
     N  [illegible]                                   N
     N                                      N
     N   . The system will ask questions about the observed systems    N
     N   . Then it will proceed to confirm the observations with some   N
     N     equipment tests                            N
     N   . Finally the system will present the corrective measures    N
     N                                      N
     N  Proceed to the equipment tests -                    N
     N                                      N
     N   . The system will ask the user to indicate interferences      N
     N     which could be causing the problem                N
     N   . Then it will proceed to confirm the interferences with      N
     N     some equipment tests                       N
     N   . Finally the system will present the corrective measures     N
     N                                      N
     N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2    N
     N                                      N
     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
     N                                      N
     N        Expert System Session Starting Point  Pg. 2/2         N
     N                                      N
     N  Proceed directly to the corrective measures -             N
     N                                      N
     N   . The system will ask the user to indicate one interference   N
     N     which is causing the problem                     N
     N   . Finally the system will present the corrective measures     N
     N   . The system assumes the user is a 100% sure of which         N
     N     interference is causing the problem                N
     N                                      N
     N                                      N
     N     PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE SESSION         N
     N                                      N
     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
EXPAND Interference only occur if more than one interfering signal

     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
     N                                      N
     N  Intermodulation  requires two  or  more  transmitters  to  be  on N
     N  simultaneously. If possible, try to determine if some combination N
     N  of transmitters must be on before the problem occurs.        N
     N                                      N
     N       PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
     N                                      N
     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

EXPAND How many modulations can you distinguish

     NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
     N                                      N
     N  Intermodulation  requires two  or  more  transmitters  to  be  on N
```

```
N  simultaneously. Therefore, usually the modulation of each can  be N
N  heard. Try to determine if this is the case.  Keep in  mind  that N
N  the relative audio levels may differ considerably,  perhaps  even N
N  to  the  extent  that  one  (or  more)  of  the signals is almost N

N        PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND If interference's voice ever stops midsentence

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                                    N
N  Intermodulation  requires two  or  more  transmitters  to  be  on N
N  simultaneously. If one of them is voice modulated, and the second N
N  transmitter is turned off mid-way through a spoken message on the N
N  first, the apparently premature termination of the message may be N
N  evident.                                                          N
N                                                                    N
N        PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND Undesired signals widely separated in frequency

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                                    N
N  The  purpose here is to determine whether or not a non-frequency  N
N  -dependent element  may be  involved in  the  interference;  for  N
N  example, signals mixing in a rusty metal joint as  opposed  to a  N
N  receiver front end.                                               N
N                                                                    N
N        PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND Undesired modulation superimposed on desired signal

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                                    N
N  Receiver cross-modulation involves the mixing of the  modulation  N
N  of  an  undesired  signal  with modulation of a desired  signal,  N
N  usually in the receiver.  Therefore, the interference  does  not  N
N  exist unless the desired signal is present also.                  N
N                                                                    N
N        PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                                                    N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND Intermodulation formulae satisfied by interfering TX

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                                                    N
N  The general intermodulation formula is as follows:                N
N                                                                    N
N  fIM = a*f1 +/- b*f2 +/- cf3 ...                                   N
```

```
N                                             N
N  where  fIM :        intermod frequency (RX freq.)        N
N        a,b,c...:   integers                     N
N        f1.f2.f3...: source frequencies              N
N                                             N

N  form:                                          N
N                                             N
N  fIM = 2*f1-f2        or         fIM = f1+f2-f3          N
N                                             N
N  Test the local transmitting frequencies in these equations and   N
N  look for a near match with the receive frequency.          N
N                                             N
N          PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2   N
N                                             N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                             N
N  The option:                                       N
N                                             N
N          Do Intermod Calculations                     N
N                                             N
N         will access a program to compute the above formulas    N
N                                             N
N       PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                             N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND Abnormal effects e.g. meters or switching circuits

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                             N
N  Some effects may include unexplained or erratic meter indications N
N  random solid-state switch activation, abnormal  noise  levels  on N
N  audio  lines,  etc.,  that  are not  readily explained by signals N
N  entering at the antenna or receiver front end.               N
N                                             N
N       PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                             N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND Oxidized metal joints near transmitters or receivers

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                             N
N  Check  for  things  such  as  rusty antenna tower hardware, metal N
N  eavestroughing or fascia, scrap wire and metal,  etc.  An oxidied N
N  metal joint can react to RF signals in a nonlinear manner (like a N
N  diode)  and  thereby  permit  signals  to  mix  and   so  produce N
N  intermodulation products.                              N
N                                             N
N       PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION      N
N                                             N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
```

EXPAND RSR formulae satisfied by undesired transmitter

```
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
N                                        N
N  Receiver spurious responses occur due to the frequency relation-  N
N  [illegible]                                          N

N                                        N
N  fIF = |a*fSR + bLO|      or      |a*fSR - bLO|          N
N                                        N
N  [illegible]                                      N
N       a,b: integers                          N
N       fSR:  spurious response frequency               N
N            (undesired signal frequency)             N
N       bLO:  local oscillator frequency              N
N                                        N
N  Values for 'a' and 'b' are typically not greater than 3.      N
N                                        N
N     PRESS RETURN/ENTER OR F8 TO CONTINUE WITH THE QUESTION     N
N                                        N
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
!******************************************************* * * *
! SECTION 5: The following are the text of the question Q1-Q23 questions
!******************************************************* * * *
TEXT Is it generally harsh, etc as opposed to clear

        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                            ::
        :: Given that you hear only one undesired modulation, is it ::
        :: generally harsh, distorted, unrecognizable, garbled (as opposed ::
        :: to clear, normal sound) ?                     ::
        ::                                                            ::
        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Undesired signals accompanied by noise

        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                            ::
        :: Do the undesired signals seem to be modulated with noise or   ::
        :: accompanied by noise (as opposed to receiver or background   ::
        :: noise)?                                        ::
        ::                                                            ::
        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Hear a 60 Hertz power line frequency buzzing sound

        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                            ::
        :: Does the interference produce a 60 Hertz (power line frequency) ::
        :: sound?                                         ::
        ::                                                            ::
        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Interference rise,fall or drift in,out on selected frequency

        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                            ::
        :: Does the sound of the interfering signal seem to rise and fall, ::
```

```
        :: or drift in and out on the selected frequency?          ::
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Interference only if more than one interfering signal

        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                         ::
        :: Does the interference only occur if more than  one  interfering ::
        :: signals present?
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT How many modulations can you distinguish

                 Note: When entering the observed symptoms, the system can
                       not diagnose the problem  if  there  are  too  many
                       "unsure" responses. Please, attempt to find out the
                       information required for the questions, rather than
                       answering "unsure".

        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                         ::
        :: How many  apparently  different  modulations  (intelligible  or ::
        :: otherwise) can you distinguish, in addition to the expected one? ::
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
TEXT If interfererence is voice ever stops midsentence

        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                         ::
        :: If the modulation of the interfering  signal  is  recognizable, ::
        :: have you ever heard it stop abruptly at an unexpected point?     ::
        ::                                                         ::
        :: e.g.  if  the  signal  is  voice modulated, has the signal ever ::
        :: stopped suddenly  in  mid- sentence?                    ::                    ::
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT How many transmitters are nearby

        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                         ::
        :: How many transmitters are nearby?                       ::
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Interference an unmodulated carrier slight whistle

        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
        ::                                                         ::
        :: Is  the interference an unmodulated  carrier  (perhaps  just  a ::
        :: slight whistle) as distinct from a  modulated  signal  (such as ::
        :: voice or other distinctly modulated service)?           ::
        ::                                                         ::
        :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT Desired signal present for interference to be noticeable

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
   [illegible]

                                                             ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

[illegible]

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
::  Are  the  undesired  signals widely separated in frequency from  ::
::  each other? (e.g. by more than approximately 5%)           ::
::                                                           ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT Interference affected by weather e.g. wind, rain, etc

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
::  Is the interference affected by weather conditions such as wind, ::
::  rain, etc?                                               ::
::                                                           ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT Undesired modulation superimposed on desired signal

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
::  Is the undesired modulation superimposed on the desired signal?  ::
::                                                           ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT Intermodulation formulae satisfied by interfering TX

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
::  Can the intermodulation formulae be satisfied by the  suspected  ::
::  interfering transmitter frequencies?                     ::
::                                                           ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT FREQ of interfering TX widely separated from desired signal

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
::  Is the frequency of the interfering transmitter widely separated ::
::  from the desired signal?                                 ::
::                                                           ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

TEXT Desired audio level increase or decrease in abrupt steps

```
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                           ::
```

```
:: Have you ever observed the desired audio level increase or ::
:: decrease in abrupt steps?                  ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::


:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Have you observed the background noise accompanying the desired ::
:: signal rise or fall in abrupt steps (with little or no other ::
:: effects)?                                               ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Receiver sensitivity below normal

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Do you notice that the receiver sensitivity is below normal ::
:: sometimes (or always) with little or no other effects?      ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Abnormal effects e.g. meters or switching circuits

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Are there any abnormal effects in the system, for example, in ::
:: meters or switching circuits, etc?                 ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Volume of interference independent of volume control

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Is the volume of the interference independent of the setting of ::
:: the volume control?                                ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Oxidized metal joints near transmitters or receivers

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Are there any oxidized metal joints near the transmitters or ::
:: the receivers?                                 ::
::                                                       ::
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT Other receivers near the affected one

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
::                                                       ::
:: Are there other receivers nearby the affected one?          ::
::                                                       ::
        ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

TEXT RSR formulae satisfied by undesired transmitter


        :: Can the receiver spurious response formulae be satisfied by the ::
        ::  undesired transmitter frequency?                          ::
        ::                                                 ::

.................................................................
!SECTION 5: The following is the text of the corrective measures
!****************************************************************
DISPLAY Transmitter Repair or AdjustmentTSE

        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *                                                    *
        * Transmitter Repair or Adjustment - A transmitter spurious *
        * emission is usually the result of a transmitter fault or *
        * misalignment. Therefore, transmitter performance should be *
        * checked carefully using a spectrum analyzer. If the analyzer is *
        * connected to the transmission line through a directional coupler, *
        * the spurious component should be easily seen. Alternatively an *
        * antenna can be used on the analyzer, but there may be some loss *
        * of linearity due to the antenna factor. (Watch for excessive *
        * signal levels into the analyzer).                         *
        *                                                    *
        *  Check for an overdriven power amplifier or other output stage, *
        * faulty shielding or internal filtering, poor grounding, antenna *
        * combiner problems, or any fault or misadjustment which might *
        * cause trouble.                                         *
        *                                                    *
        *                                                    *
        *     PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2        *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *


        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *                                                    *
        *    Transmitter Repair or Adjustment (continued)  Pg. 2/2      *
        *                                                    *
        *  Privately owned equipment should be repaired or adjusted only *
        * by the owner or his authorized representative. This will avoid *
        * the possibility of being held responsible for an equipment *
        * malfunction at a later date. In this case, DOC involvement may be *
        * required.                                              *
        *                                                    *
        * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
        *                                                    *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 DISPLAY Transmitter AdjustmentTI

        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *                                                    *
        * Transmitter Repair or Adjustment  - A transmitter intermodulation *
        * product may be caused by a transmitter fault or misalignment. *
        * Therefore, performance of the transmitter from which the *
* undesired signal is radiating should be checked against its *
* specifications. Misadjustment of the final amplifier, output *
* circuitry, combiners, multiplexers, filters, antenna, etc. can *
* cause mismatches and non-linearity in the system. Non-linearity *
* is a key ingredient of intermodulation. Any misalignment should *
* [illegible] *
*                                                        *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *




* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                        *
*    Transmitter Repair or Adjustment (continued)   Pg. 2/2       *
*                                                        *
*   Privately owned equipment should be repaired or adjusted only *
* by the owner or his authorized representative. This will avoid *
* the possibility of being held responsible for an equipment *
* malfunction at a later date. In this case, DOC involvement may be *
* required.                                              *
*                                                        *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY FilteringTSE

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                        *
* Filtering - If the transmitter involved is operating up to its *
* optimum specifications and the problem persists, filtering may be *
* used to reduce a spurious emission. A band-pass filter is best *
* because it will attenuate all unwanted frequency components *
* unless they are very close to the carrier frequency.         *
*                                                        *
*   Alternately, a band reject filter on the transmitter tuned to *
* the desired receive frequency could be used, but this is not as *
* good since it will only attenuate one spurious emission (there *
* may be others). It should protect the receiver in question, *
* however.                                               *
*                                                        *
*                                                        *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *




* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                        *
*    Filtering                  (continued)  Pg. 2/2       *
*                                                              *
* Consideration should be given to the cost of filtering, filter *
* insertion loss, attenuation required and ownership of the    *
* equipment.                                                   *
*                                                              *


.                                                              .
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY FilteringTI

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
*                                                              *
* Filtering - If the transmitter involved is operating up to its *
* optimum specifications and the problem persists, filtering may be *
* used to reduce a transmitter intermodulation product.        *
*                                                              *
*  First determine which transmitter is generating the interfering *
* signal. This can be determined by using a spectrum analyzer  *
* either with an antenna, or by using a directional coupler in the *
* transmission line. (Watch for excessive levels into the spectrum *
* analyzer.)                                                   *
*                                                              *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/3     *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *




* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                              *
*    Filtering                (continued)  Pg. 2/3             *
*                                                              *
*  There are several devices which can be used to reduce the   *
* interference. A band-pass filter on the offending transmitter is *
* usually effective, and a good place to start. If this is     *
* inadequate, a band reject filter tuned to block the incoming *
* signal from the second transmitter should help. In a severe case *
* a second band reject filter tuned to the desired receive     *
* frequency should stop the intermodulation product from being *
* transmitted.                                                 *
*                                                              *
*  Also available are isolators which tend to pass a signal in one *
* direction only. This would allow the transmitter signal to go out, *
* but block the undesired signal from the second transmitter from *
* entering the system. Other devices include multicouplers, hybrid *
* couplers, and circulators which can be used to increase isolation *
* between the transmitters.                                    *
*                                                              *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE               *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                              *
*    Filtering                (continued)  Pg. 3/3             *
*                                         *
*                                         *
* Consideration should be given to the cost of filtering, filter  *
* insertion loss, attenuation required and ownership of the  *
* equipment.                                   *
*                                         *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                         *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY FilteringREST

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                         *
* Filtering  - A bandpass filter on the receiver will attenuate the  *
* interfering off channel signals unless they are  very close  in  *
* frequency.  Alternately, a band-reject filter(s) tuned to the  *
* frequency of the off channel interfering signal(s) should be  *
* effective.  A more severe case might require a combination of  *
* these filters.                               *
*                                         *
*   If the frequency separation is very small, a sharper filter  *
* such as a crystal filter might be necessary.  These, however, are  *
* not tunable and must be cut to one specific frequency.       *
*                                         *
*       PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *




* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                         *
*    Filtering                  (continued)  Pg. 2/2       *
*                                         *
* Consideration should be given to the cost of filtering, filter  *
* insertion loss, attenuation required and ownership of the  *
* equipment.                                   *
*                                         *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                         *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Physical SeparationA

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                         *
* Physical Separation  -  In some cases a change of receiver or  *
* transmitter site such that the separation between the systems  *
* involved is increased will eliminate the interference.  A change  *
* of antenna position for co-sited antennas may have the same  *
* effect. For vertically polarized antennas, vertical separation on  *
* the same mast may be more effective than comparable horizontal  *
* separation.  Altering the antenna azimuth (for directional  *
* antennas) can be used to advantage in some cases provided that  *
* redirecting the antenna does not create a service area coverage  *
```

```
    * problem.                                          *
    *                                                 *
    *  These techniques can effectively increase the attenuation *
    * between the systems involved without degrading performance in any *
    *                                                 *
                                                      *

    *   PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE   *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *



    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                                 *
    *    Physical Separation         (continued)  Pg. 2/2      *
    *                                                 *
    * Consideration should be given to costs, site availability, *
    * separation required, effects on service areas and system *
    * performance, and equipment ownership.                       *
    *                                                 *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                                 *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Frequency ChangeTSE

    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                                 *
    * Frequency change - In a difficult case a change of receive *
    * frequency may solve the problem, but this solution is not usually *
    * recommended.                                            *
    *                                                 *
    *   Tnis is a poor solution because it does not correct the problem *
    * at its source. With a spurious emission, other frequencies may *
    * also be affected. Consideration should also be given to the loss *
    * of usable spectrum that occurs each time a frequency must be *
    * abandoned due to interference.                              *
    *                                                 *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                                 *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Frequency ChangeTIERRI

    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                                 *
    * Frequency Change - Changing the frequency of one transmitter *
    * involved in the intermodulation product, or changing the receive *
    * frequency will usually solve this problem, but should be done *
    * only when all else fails.                               *
    *                                                 *
    * Consideration should be given to the loss of usable spectrum that *
    * occurs each time a frequency must be abandoned due to *
    * interference. If this approach is used, be careful not to create *
    * a new harmful intermodulation product.                      *
    *                                                 *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                                 *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Frequency ChangeRRRSR
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                          *
* Frequency Change - In a difficult case a change of receive *
* frequency may solve the problem, but this solution is not usually *
* recommended.                                                    *
*                                                          *
*   Normally this problem can be easily corrected by other means. *
* Consideration should also be given to the loss of usable spectrum *
* that occurs each time a frequency must be abandoned due to *
* interference.                                                 *
*                                                          *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Frequency ChangeRCMAR

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                          *
* Frequency Change - A frequency change would not likely be *
* effective in eliminating this type of interference unless there *
* is some unusual frequency dependent effect occurring.          *
*                                                          *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Frequency ChangeRD

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                          *
* Frequency change - In a difficult case a change of receive *
* frequency may solve the problem, but should be done only when all *
* else fails.                                                 *
*                                                          *
* Consideration should be given to the loss of usable spectrum that *
* occurs each time a frequency must be abandoned due to *
* interference.                                                 *
*                                                          *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Power ReductionTSE

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                          *
* Power Reduction - If the requirements permit, reducing the power *
* output of the transmitter may solve the problem. The output level *
* of the emission will usually be reduced either in proportion to *
* the carrier level, or by a greater amount. (e.g.: a 3 dB decrease *
* in carrier level may cause a 6 dB decrease in level of the *
* spurious emission).                                            *
*                                                          *
*                                                          *
*       PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

```
*************************************
*                                   *
*    Power Reduction         (continued)  Pg. 2/2   *
*                                   *
* Consideration  should  be given  to ownership of the transmitter,  *
* and the loss in transmitter  service area that will result.  This  *
* solution may not be effective  or reliable  because the  tendency  *
* for a spurious emission to be unstable may  cause it to  increase  *
* in strength with time.                *
*                                   *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
*                                   *
*************************************
DISPLAY Power ReductionTI

*************************************
*                                   *
* Power Reduction  -  If the requirements permit,  the interference  *
* may be reduced or eliminated by reducing the power output of  the  *
* transmitter whose signal is entering the transmitter  from  which  *
* the interfering signal is being radiated.  Reducing the power  of  *
* the host transmitter may also  help,  but  usually  to  a  lesser  *
* extent.                            *
*                                   *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2        *
*************************************
```

```
*************************************
*                                   *
*    Power Reduction              (continued)  Pg. 2/2    *
*                                   *
* Consideration  should  be given  to ownership of the transmitter,  *
* and the loss in transmitter  service area that will result.      *
*                                   *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
*                                   *
*************************************
DISPLAY Power ReductionREST
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                    *
* Power Reduction - If the output power of the interfering *
* station(s) can be reduced, especially those producing the highest *
* level signals at the receiver, the interference should be reduced *
* [illegible]                                                  *
*                                                    *
* Consideration should be given to ownership of the transmitter, *
* and the loss in transmitter service area that will result.     *
*                                                    *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                    *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

DISPLAY Receiver DesensitizationA

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                    *
* Receiver Desensitization - If requirements permit, (including *
* TESP requirements) and if the interference is not severe, a *
* reduction in receiver sensitivity may prevent the interfering *
* signal from causing problems. This can be done by increasing the *
* squelch level, decreasing sensitivity internally, or by adding *
* attenuation in the antenna feed line.                  *
*                                                    *
*                                                    *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2        *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                    *
*    Receiver Desensitization           (continued)  Pg. 2/2   *
*                                                    *
* Consideration should be given to the loss of effective receiver *
* coverage area will result. This is generally a poor solution *
* because it does not cure the problem at its source. Also, if *
* conditions change with time, the interfering signal may increase, *
* thus negating the effects of the desensitization.      *
*                                                    *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                    *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

DISPLAY Receiver DesensitizationB

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                    *
* Receiver Desensitization - If requirements permit, (including *
* TESP requirements) adding attenuation in the antenna feed line is *
* effective towards reducing this type of interference. The amount *
* required may be determined experimentally.          *
*                                                      *
*                                                      *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2      *
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                      *
*    Receiver Desensitization          (continued)  Pg. 2/2    *
*                                                      *
* Consideration should be given to the loss of  effective  receiver *
* coverage area will result. This is often not the optimum solution *
* for this reason.                                     *
*                                                      *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                      *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

DISPLAY Transmitter AttenuationA

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                      *
* Transmitter Attenuation - One method for achieving a reduction in *
* intermodulation signal level is to  use a  transmitter  of higher *
* power than required, and add a  section  of  lossy coax to reduce *
* the ERP back to the original level.  For example,  if  a  50 watt *
* transmitter is used where only 10 watts are required and a  piece *
* of coax with 7dB of loss is inserted, the output will be 10 watts *
* as required.                                         *
*                                                      *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2      *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                      *
*    Transmitter Attenuation          (continued)  Pg. 2/2    *
*                                                      *
* Now any offending signal entering the system will be  attenuated  *
```

```
     * by an extra 7 dB. The resultant intermodulation  product (if any)  *
     * will face another 7 dB of  loss  on the way out.                   *
     *                                                                    *
     * This  provides  a  minimum  of   14  dB  of  attenuation  to       *
     * intermodulation over the entire band, and usually more because of *
     * [illegible] for mixing. This also tends to                         *
     * stabilize the antenna system in terms of VSWR.                     *
     *                                                                    *
     * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
     *                                                                    *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Receiver RepairsA

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                                    *
     * Receiver Repairs - Check for and repair loose or faulty shielding  *
     * or circuit bypassing in the  offending  receiver.  Make  sure the  *
     * cabinet is  installed properly.  Be  sure grounding  is installed  *
     * properly or improve grounding, if possible.                        *
     *                                                                    *
     * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
     *                                                                    *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Receiver Adjustments or ModificationA

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                                    *
     * Receiver Adjustments/Modifications -                               *
     *                                                                    *
     *   a) One  solution  is  to  offset  the  local oscillator and  IF  *
     * frequency far enough  to  move the  interfering  signal  off  the  *
     * desired frequency.  This is usually  effective  without  creating  *
     * other problems.                                                    *
     *                                                                    *
     *   b) An alternative to (a) if the local oscillator is the problem  *
     * is to change  the  L.O.  frequency  to  the  other  side  of  the  *
     * receive frequency.  The mixer output will remain on  the original  *
     * IF frequency, but the L.O.  frequency  will be shifted far enough  *
     * to stop the interference.                                          *
     *                                                                    *
     *                                                                    *
     *      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2           *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *



     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                                    *
     *    Receiver Adjustments/Modifications   (continued)  Pg. 2/2       *
     *                                                                    *
     * If either of the  two  proceeding methods  is used,  observe  the  *
     * manufacturers alignment procedures and check receiver performance  *
     * carefully afterwards.                                              *
     *                                                                    *
     * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
     *                                                                    *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Receiver ReplacementA

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                   *

     *
     * [illegible], particularly one with a different local oscillator *
     * frequency, the problem may be solved.                          *
     *                                                   *
     * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
     *                                                   *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Bonding and Grounding of MetalA

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                   *
     * Bonding  and  Grounding  of  Metal  -  If  the  source  of  the *
     * rectification can be located in  a metal  structure,  the problem *
     * can be corrected  by  shorting or bypassing the rectifying joint. *
     * This can be done in most cases  by  welding or  soldering the two *
     * pieces together at the joint,  tightening any connectors, clamps, *
     * bolts or screws involved, or by adding a strap or wire across the *
     * joint to effectively bypass it electrically.                   *
     *                                                   *
     *   Alternately, if the two pieces can be isolated  from each other *
     * with any nonconductive material (including air) the rectification *
     * will be eliminated.  Ensuring  that  the  structure  is  properly *
     * grounded (if possible)  will also  help.  If the structure is not *
     * needed at  that location,  one sure  solution is simply to remove *
     * it completely.                                       *
     *                                                   *
     *                                                   *
     *      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2          *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                   *
     *     Bonding and Grounding of Metal   (continued)   Pg. 2/2        *
     *                                                   *
     * Consideration should be given to  any  effects that  changes will *
     * have  on  the  integrity  of  the  structure   (mechanically  and *
     * electrically), and to its ownership. This is the optimum solution *
     * to the problem.                                        *
     *                                                   *
     * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
     *                                                   *
     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Filtering or BypassingA

     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
     *                                                   *
     * Filtering or Bypassing- If the reradiation source is a  piece  of *
     * radio equipment, filtering the  antenna  input to  attenuate  the *
     * undesired incoming or outgoing signals may help. If it is a piece *
     * of non-radio equipment, filtering or bypassing inputs and outputs *
     * or  circuit  elements  may  prevent  the  RF  from  reaching  the *
     * rectifying element.  This is similar in some respects to an audio *
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    * rectification problem.                    *
    *                                    *
    * Consideration should be given to the possible degradation of *
    * equipment performance, costs and equipment ownership.        *
    *                                    *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                    *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Alternate ReceiverA

    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                    *
    * Alternate Receiver - If the offending receiver can be traded for *
    * another, particularly one which uses different local oscillator *
    * and/or IF frequencies, the problem may be solved. Because the *
    * frequency relationships are the key to the problem, changing one *
    * of the factors such as IF or local oscillator will stop the *
    * interference. The offending receiver may be fine in another *
    * environment.                              *
    *                                    *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                    *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Receiver RealignmentA

    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                    *
    * Receiver Realignment - One alternative is to offset the IF *
    * frequency and realign the receiver accordingly. If enough offset *
    * is used the problem should clear. Because the frequency *
    * relationships are the key to the problem, changing any of the *
    * factors, such as the IF and LO, will solve the problem. Observe *
    * the manufacturers alignment procedures while doing this, and *
    * check receiver performance carefully afterwards.         *
    *                                    *
    * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
    *                                    *
    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Signal Entering Via Power CordA

    * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    *                                    *
    * Signal Entering Via Power Cord - Turn the receiver on, turn the *
    * volume up relatively high and open the squelch completely. While *
    * the interference is on, pull the power plug from the wall.      *
    *                                    *
    *  If the Interference stops instantly while the receiver noise *
    * fades slowly, then the signal is probably entering via the power *
    * cord. If both fade together there is probably another entry point. *
    *                                    *
    *  Power line RF filtering techniques should help in this case. *
    * Also try moving the plug to a different receptacle or circuit. *
    * Avoid long cords if possible. If a filter is used, be sure the *
    * voltage and current ratings of the components are adequate. *
    * Install the filter inside or as close to the equipment as *
    * possible.                                 *
    *                                    *
*                                                   *
*     PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2        *
*****************************************************


*****************************************************
*                                                   *
*    Signal Entering Via Power Cord     (continued)   Pg. 2/2      *
*                                                   *
* [illegible]                                       *
* safety codes to avoid creating an electric shock hazard with *
* these modifications.                                 *
*                                                   *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                   *
*****************************************************
DISPLAY Signal Entering Via External WiringA

*****************************************************
*                                                   *
* Signal Entering Via External Wiring - Disconnect any external *
* wires one at a time while the interference is occurring. These *
* may include speaker wires, microphone, remote control lines, *
* ground wires, etc.                                   *
*                                                   *
*  Having isolated the entry points, two corrective methods can be *
* used. One is to shield the affected wires to prevent the signal *
* from reaching them. The shield should be grounded at both ends, *
* provided no ground loop problem is created. Otherwise, grounding *
* near the equipment should suffice. The second method is to filter *
* the inputs and outputs of the equipment.                 *
*                                                   *
*                                                   *
*      PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE   Pg. 1/2       *
*****************************************************



*****************************************************
*                                                   *
*    Signal Entering External Wiring  (continued)  Pg. 2/2      *
*                                                   *
*  These filters should be placed inside the equipment, if *
* possible, or at least as close as possible to the connections on *
* the outside. Keep all wires short. Component values should be *
* carefully selected so as not to degrade the system performance. *
* If the ground wire is involved, the grounding may need to be *
* checked or improved.                                 *
*                                                   *
*                                                   *
*****************************************************
DISPLAY Signal Entering Via Coaxial CableA

*****************************************************
*                                                   *
* Signal entering Via Coaxial Cable - Occasionally an unwanted *
* signal will ride in on the shield of a coaxial cable. One *
* technique which often works is to install a toroid on the cable. *
* A toroid is a doughnut shaped ring of iron powder or ferrite *
* material. The cable is simply looped through the hole several *
* times. The number of turns should be determined experimentally *
* but usually ranges from 4 to 10 turns. Choose a toroid with a *
* high permeability. If the cable is too large or rigid, a patch *
* cord can be made up of smaller cable. This technique will also *
* work on other external wiring, including the power cord. It is *
* sometimes cumbersome however.                                  *
*                                                                *
*     PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2         *
**************************************



**************************************
*                                                                *
*    Signal Entering Via Coaxial Cable   (continued)  Pg. 2/2    *
*                                                                *
*  Another test that can be made is to ground the shield or *
* improve the existing ground. Any signals on the shield should be *
* removed this way.                                              *
*                                                                *
* PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE *
*                                                                *
**************************************
DISPLAY Circuit BypassingA

**************************************
*                                                                *
* Circuit Bypassing - If the previous methods have been *
* unsuccessful, bypassing of individual circuit elements may be *
* necessary. A very strong signal may enter the circuitry directly *
* or defy filtering at entry points. Therefore, bypassing the *
* non-linear elements where the rectification occurs will usually *
* help. Transistors are a good place to start, but any semi- *
* conductor device, tube or even a bad solder joint can be at fault. *
*                                                                *
*                                                                *
*     PRESS PAGE DOWN (PG DN) OR F1 TO CONTINUE  Pg. 1/2         *
**************************************



**************************************
*                                                                *
```

```
        *   Circuit Bypassing            (continued)  Pg. 2/2   *
        *                                            *
        *   Component values used in the filters are not critical. However,  *
        * be sure placement and values selected will not adversely affect  *
        * [illegible] may have to be located. *

        * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
        *                                            *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
[illegible]

        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *                                            *
        * Shielding - One way to reduce the signal level striking the *
        * affected equipment is by using shielded cabinets. This may not *
        * always be practical, but is usually effective. All inputs and *
        * outputs to the cabinet must be filtered. If the problem is *
        * widespread, a shielded room might be considered.          *
        *                                            *
        * Consideration should be given to the costs and practicality.     *
        *                                            *
        * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
        *                                            *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
DISPLAY Equipment ChangeA

        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
        *                                            *
        * Equipment Change - Replacing the receiving equipment with a *
        * different model may often be sufficient to correct the *
        * interference. Each will have different characteristics which may *
        * make it more or less susceptible to audio rectification. This *
        * also applies to external ancillary audio equipment. The offending *
        * equipment may be fine in another environment.              *
        *                                            *
        * PRESS F7 TO PRINT THIS CORRECTIVE MEASURE OR "RETURN" TO CONTINUE  *
        *                                            *
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
END
```

SORT.PAS

```
program  sort(input,output);

{this program receives information from the expert system}
{and returns the boolean hypothesis set in descending order with}
{the normalized scores and the textual hypothesis set}

{The following include file is a library file set up}
{to allow the passing via memory of data to/from insight 2+}
{knowledge bases}

{$I C:\emia\emib\asciiprm.pas}

{set up nine boolean variables which indicate if an interference}
{is in the hypothesis set}

const
        num1:boolean=False;
        num2:boolean=False;
        num3:boolean=False;
        num4:boolean=False;
        num5:boolean=False;
        num6:boolean=False;
        num7:boolean=False;
        num8:boolean=False;
        num9:boolean=False;

{set up a record with 4 fields, interference's order, accumulated}
{score, max score, interferences name }

type
    inter=string[30];
      s= record
              name:char;
              score:real;
              max:real;
              realname:string[30];
           end;

{ variables to hold  receive the interferences accumulated}
{and maximum scores from the expert system}

var
      tse:real;
      ti:real;
      rr:real;
      er:real;
      ri:real;
      rcm:real;
      rd:real;
      rsr:real;
      ar:real;
      maxtse:real;
      maxti:real;
      maxrr:real;
```

```
        maxer:real;
        maxri:real;
        maxrcm:real;
        maxrd:real;
        maxrsr:real;
        maxar:real;

{ an array to of records about each interference}
        interferences: array [1..9] of s;

{variables to hold temporary values}
        temp:s;
        count:integer;
        count1:integer;
        count2:real;

{SECTION 1: read in from EMIRULES.PAS the scores using library programs}
Begin
INIT_PARAM_ADDR;
READ_REAL(tse);
READ_REAL(ti);
READ_REAL(rr);
READ_REAL(er);
READ_REAL(ri);
READ_REAL(rcm);
READ_REAL(rd);
READ_REAL(rsr);
READ_REAL(ar);
READ_REAL(maxtse);
READ_REAL(maxti);
READ_REAL(maxrr);
READ_REAL(maxer);
READ_REAL(maxri);
READ_REAL(maxrcm);
READ_REAL(maxrd);
READ_REAL(maxrsr);
READ_REAL(maxar);

{set up a array of interferences}

          interferences[1].name:='a';
          interferences[1].score:=tse;
          interferences[1].max:=maxtse;
          interferences[1].realname:='Transmitter Spurious Emission';
          interferences[2].name:='b';
          interferences[2].score:=ti;
          interferences[2].max:=maxti;
          interferences[2].realname:='Transmitter Intermodulation';
          interferences[3].name:='c';
          interferences[3].score:=rr;
          interferences[3].max:=maxrr;
          interferences[3].realname:='Receiver Radiation';
          interferences[4].name:='d';
          interferences[4].score:=er;
          interferences[4].max:=maxer;
          interferences[4].realname:='External Rectification';
          interferences[5].name:='e';
        interferences[5].score:=ri;
        interferences[5].max:=maxri;
        interferences[5].realname:='Receiver Intermodulation';
        interferences[6].name:='f';
        interferences[6].score:=rcm;
        interferences[6].max:=maxrcm;
        interferences[6].realname:='Receiver Cross Modulation';
        interferences[7].name:='g';
        interferences[7].score:=rd;
        interferences[7].max:=maxrd;
        interferences[7].realname:='Receiver Desensitization';
        interferences[8].name:='h';
        interferences[8].score:=rsr;
        interferences[8].max:=maxrsr;
        interferences[8].realname:='Receiver Spurious Response';
        interferences[9].name:='i';
        interferences[9].score:=ar;
        interferences[9].max:=maxar;
        interferences[9].realname:='Audio Rectification';

{SECTION 2: Normalize each score}

   count:=1;
   for count:= 1 to 9 do
          begin
               if interferences[count].score>0
               then interferences[count].score:= (interferences[count].score*100) / interferences[count].max;
          end;

{assign to variables the normalized scores}
          tse:=interferences[1].score;
          ti:=interferences[2].score;
          rr:=interferences[3].score;
          er:=interferences[4].score;
          ri:=interferences[5].score;
          rcm:=interferences[6].score;
          rd:=interferences[7].score;
          rsr:=interferences[8].score;
          ar:=interferences[9].score;

{SECTION 3: sort in descending order}
   count1:=1;
   for count1:= 1 to 10 do
         begin
              count:=1;
              for count:= 1 to 9 do
                  begin
                        if interferences[count].score<interferences[count+1].score
                        then
                                  begin
                                      temp:=interferences[count];
                                      interferences[count]:=interferences[count+1];
                                      interferences[count+1]:=temp;
                                  end;
                  end;
         end;
```

```
{SECTION 4: assign to the boolean and textual hypothesis set each interference}
{within 10% of the highest scoring interference}

count2:=interferences[1].score;
count1:=1;
count:=0;
for count1:= 1 to 9 do
      begin

          if interferences[count1].score > (count2-(count2 / 10))
            then
              begin
              count:=count+1;
                case interferences[count1].name of
                      ‘a’:num1:=True;
                      ‘b’:num2:=True;
                      ‘c’:num3:=True;
                      ‘d’:num4:=True;
                      ‘e’:num5:=True;
                      ‘f’:num6:=True;
                      ‘g’:num7:=True;
                      ‘h’:num8:=True;
                      ‘i’:num9:=True;
                  end;
              end
                    else Interferences[count1].realname:=’ ‘;
              end;


{SECTION 5: sent to EMIRULES.PAS the boolean hypothesis set}
{the descending order hypothesis set and the normalized scores}


INIT_PARAM_ADDR;
RESET_PARAM_MEMORY(27);

WRITE_BOOLEAN(num1);
WRITE_BOOLEAN(num2);
WRITE_BOOLEAN(num3);
WRITE_BOOLEAN(num4);
WRITE_BOOLEAN(num5);
WRITE_BOOLEAN(num6);
WRITE_BOOLEAN(num7);
WRITE_BOOLEAN(num8);
WRITE_BOOLEAN(num9);

{sents to the expert system the desending order hypothesis set}
count1:=1;
        WRITE_STRING(interferences[count1].realname);
        WRITE_STRING(interferences[count1+1].realname);
        WRITE_STRING(interferences[count1+2].realname);
        WRITE_STRING(interferences[count1+3].realname);
        WRITE_STRING(interferences[count1+4].realname);
        WRITE_STRING(interferences[count1+5].realname);
        WRITE_STRING(interferences[count1+6].realname);
        WRITE_STRING(interferences[count1+7].realname);
        WRITE_STRING(interferences[count1+8].realname);
{sents to the expert system the normalized scores}
WRITE_REAL(tse);
WRITE_REAL(ti);
WRITE_REAL(rr);
WRITE_REAL(er);
WRITE_REAL(ri);
WRITE_REAL(rcm);
WRITE_REAL(rd);
WRITE_REAL(rsr);
WRITE_REAL(ar);

end.
```

REPORT1.PAS

```
PROGRAM  REPORT1(INPUT,OUTPUT);
{Procedures Generated By Screen Sculptor,Version 1.2 2/22/1988 - 10:34:38 }
CONST CopyrightSS='(C)Copyright 84,85 The Software Bottling Company Of New York';
{    DO NOT REMOVE The Above Copyright Notice
          This Program may not be used without the above Copyright Notice
}
{  SCREEN SCULPTOR(C) Version 1.2
      (C) COPYRIGHT, THE SOFTWARE BOTTLING COMPANY OF NEW YORK, 1984, 1985
      WARNING: Do not attempt to make any changes to this procedure unless you
      have made a backup. The Software Bottling Company Of New York can not
      and will not support such changes made to this program.
      Turbo(tm) Pascal Version, Trade Mark Of Borland International}

{ Global Required Definition of variables and constants }

TYPE  STR2 = STRING[2]; STR80 = STRING[80]; STR79 = STRING[79];
           resSS = (staySS, prevSS, exitSS, nextSS);

CONST { Esc, Up Arrow Key, Left Arrow Key , Page Up Key       }
           escSS=#27;    uSS='H'; lSS='K'; puSS='I';
           { Blank, Down Arrow Key, Right Arrow Key, Page Down Key }
           blankSS=' '; dSS='P'; rSS='M'; pdSS='Q';
           { Function keys  F1-F10 }
           f1SS=';'; f2SS='<'; f3SS='='; f4SS='>'; f5SS='?';
           f6SS='@'; f7SS='A'; f8SS='B'; f9SS='C'; f10SS='D';
           retSS : STR2='';

VAR   actionSS, last_field_actionSS : resSS;
           hiSS, loSS : REAL;
           vtypeSS, screenSS, use_screenSS, screen_fieldSS, varSS : INTEGER;
           file_existSS, last_fieldSS, retrieveSS : BOOLEAN;
           rangeSS : STR80;
           BeepOnSS: BOOLEAN;
temp:text;
x,key:char;
z:integer;

{$V-,C-,R-} { Pascal Directives. See Compiler Manual }
{$I TURPROCS.TUR  Include Procedures In This File. See Manual }

(*  This is a summary of the procedures in TURPROCS.TUR

PROCEDURE BEEP(BeepOn: BOOLEAN);              { Sound Beep if BeepOn=TRUE }
PROCEDURE CLEAR_KBD;                     { Clear Keyboard Buffer }
PROCEDURE COLOR(foregr,backgr:BYTE);          { Set Color }
PROCEDURE WRITEC(vtext: STR80);               { Write Chars Using Color }
FUNCTION  SET_MONITOR_TYPE: INTEGER;          { Determine Monitor Type }
{ Display A Screen Sculptor Screen }       { 2=Color, 3=Mono }
PROCEDURE DISPLAY_SCREEN(screen_name: STR80; VAR file_existSS: BOOLEAN);
{ Display And Get An Item From Screen. See Detailed Desription In Manual }
PROCEDURE GETITEM(
                              COL,LIN,LEN :       BYTE;    { Column, Line, Length }
                              ITYPE :          CHAR;    { Type= C, N, D, Y, M  }
                         VAR WITEM :           STR80;   { Variable Name        }
```

```
                    PICT :              STR80;   { Picture X, U, L, 9, 8 # }
                    ITEM_LOW,ITEM_HIGH : STR80;   { Range - Numerics/Date Only}
                VAR RET :               STR2;    { Returned Code        }
                    RETRIEVE :          BOOLEAN; { False=Disp Only, True=Get }
                    FGR_COLOR,BGR_COLOR : BYTE      { Colors Foregr, Backgr }
                    ); EXTERN;

*)

PROCEDURE RET_STATUS;
{ Check Status Of Variable retSS and return a code in 'actionSS' & set 'varSS'
  This procedure is called immediately following GETITEM }

{ Input to this procedure:
  when retSS is length 1 the values are any of the ASCII chars
  when retSS is length 2 the values are uSS, lSS, puSS, pdSS, function keys
                                                                 dSS, rSS
                                                                 ( See CONST Section For Meanings ) }
{ Output:
  The following codes are returned in actionSS : nextSS, prevSS,
                                                                              exitSS, staySS }
{ Based upon 'actionSS' this procedure will then set 'varSS' to an integer,
  which represents the next item (variable ) to get. }
BEGIN
  last_field_actionSS:=exitSS;
  actionSS:=nextSS; { Initialize Action Code }
  if retrieveSS then { Is retrieveSS TRUE? }
  begin
    if ord(retSS[0])=2 then { Is retSS length 2 ? }
    begin
      CASE retSS[2] of
      { Action to be taken depending on the last key pressed }
        uSS, lSS: actionSS:=prevSS;  { Up Key, Left Key }
        dSS, rSS: actionSS:=nextSS;  {Down Key, Right Key}
        puSS: actionSS:= { Page Up   }staySS;
        pdSS: actionSS:= { Page Down }staySS;
        f1SS,f2SS,f3SS,f4SS,f5SS,
        f6SS,f7SS,f8SS,f9SS,f10SS: actionSS:=staySS; { Function Key }
      END { Case ret };
    end else { retSS is length 1 }
    begin
      if retSS=escSS { Escape Key } then actionSS:=staySS
    end;
  { Any other key not in the above list will keep actionSS=nextSS }
  end; {retrieveSS}
  CASE actionSS of
    staySS: ;
    nextSS: begin
              varSS:=varSS+1; if varSS>screen_fieldSS then varSS:=1;
              if last_fieldSS and retrieveSS then actionSS:=last_field_actionSS
            end;
    prevSS: begin varSS:=varSS-1; if varSS<1 then varSS:=screen_fieldSS end;
    exitSS: ;
  END; { CASE }
END; {PROCEDURE RET_STATUS}

PROCEDURE GETNUM(
                COL,LIN,LEN :      BYTE;    { Column, Line, Length }
                ITYPE :            CHAR;    { Type= C, N, D, Y, M  }
            VAR WITEM :            REAL;    { Numerci Variable Name }
                PICT :             STR80;   { Picture X, U, L, 9, 8 # }
                ITEM_LOW,ITEM_HIGH : REAL;   { Range - Numerics/Date Only}
            VAR RET :              STR2;    { Returned Code       }
                RETRIEVE :         BOOLEAN; { False=Disp Only, True=Get }
                FGR_COLOR,BGR_COLOR : BYTE   { Colors Foregr, Backgr }
                );
{ This Procedure converts numeric to string before calling GETITEM }
{ It then converts the result back to numeric }
VAR numSS,numloSS,numhiSS: STR80; errorcodeSS,dec_posSS: INTEGER;
BEGIN
   { Get # of Decimal Positions }
   dec_posSS:=ord(pict[0])-pos('.',pict);
   { Convert item, low and high range to string }
   STR(witem:0:dec_posSS,numSS);
   STR(item_low:0:dec_posSS,numloSS);
   STR(item_high:0:dec_posSS,numhiSS);
   GETITEM(col,lin,len,itype,numSS,pict,numloSS,numhiSS,
            ret,retrieve,fgr_color,bgr_color);
   { Convert string to numeric item }
   VAL(numSS, witem, errorcodeSS);
END; { GETNUM }


VAR { Variables Section For C:INPUT }
     INDICATOR: STRING[1];

PROCEDURE INIT_VAR_1; { C:INPUT }
{ Initialize Variables To Default Values }
BEGIN
      INDICATOR:='';
END; { PROCEDURE INIT_VARS_1}

PROCEDURE SCREEN_1; { C:INPUT }
BEGIN

if screenSS<>1 then
begin
   screenSS:=1; screen_fieldSS:=1; varSS:=1;
   retrieveSS:=FALSE; last_fieldSS:=FALSE; .
   DISPLAY_SCREEN('INPUT.SCR',file_existSS); { Display Screen }
   if not file_existSS then
   begin gotoxy(1,1); write('Missing Screen INPUT') end;
end;
retSS:='';

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
   CASE varSS of
1:  GETITEM(31,16,1,'C',INDICATOR,
         'X','','',retSS,retrieveSS,11,8);
   END; { CASE }

   if varSS=screen_fieldSS then last_fieldSS:=TRUE;
   RET_STATUS; { Check the code in "retSS". Set "varSS" and "actionSS" }
```

```
{ Check to see whether to switch retrieveSS to true }
if last_fieldSS and (not retrieveSS) then
begin
   retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
end else
   last_fieldSS:=FALSE;

UNTIL actionSS=exitSS
END; { PROCEDURE SCREEN_1 }

VAR { Variables Section For C:INPUT1 }
      SITE: STRING[20]; PREPAREDBY: STRING[21]; FACILITY: REAL;
      TELEPHONEA: STRING[3]; TELEPHONEB: STRING[3]; TELEPHONEC: STRING[4];
      TELEPHONED: STRING[4]; DATE: STRING[8]; T: REAL;

PROCEDURE INIT_VAR_2; { C:INPUT1 }
{ Initialize Variables To Default Values }
BEGIN
      SITE:=''; PREPAREDBY:=''; FACILITY:=2; TELEPHONEA:=''; TELEPHONEB:='';
      TELEPHONEC:=''; TELEPHONED:=''; DATE:='  /  /'; T:=2;
END; { PROCEDURE INIT_VARS_2}

PROCEDURE SCREEN_2; { C:INPUT1 }
BEGIN

if screenSS<>2 then
begin
   screenSS:=2; screen_fieldSS:=9; varSS:=1;
   retrieveSS:=FALSE; last_fieldSS:=FALSE;
   DISPLAY_SCREEN('INPUT1.SCR',file_existSS); { Display Screen }
   if not file_existSS then
   begin gotoxy(1,1); write('Missing Screen INPUT1') end;
end;
retSS:='';

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
   CASE varSS of
1:  GETITEM(7,8,20,'C',SITE,
       'XXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
2:  GETITEM(14,10,21,'C',PREPAREDBY,
       'XXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
3:  GETNUM(43,12,1,'N',FACILITY,
       '#',1.0,2.0,retSS,retrieveSS,11,0);
4:  GETITEM(13,14,3,'C',TELEPHONEA,
       '888','','',retSS,retrieveSS,11,0);
5:  GETITEM(18,14,3,'C',TELEPHONEB,
       '888','','',retSS,retrieveSS,11,0);
6:  GETITEM(22,14,4,'C',TELEPHONEC,
       '8888','','',retSS,retrieveSS,11,0);
7:  GETITEM(34,14,4,'C',TELEPHONED,
       '8888','','',retSS,retrieveSS,11,0);
8:  GETITEM(24,16,8,'D',DATE,
       '88/88/88','  /  / ','  /  / ',retSS,retrieveSS,11,0);
9:  GETNUM(48,19,1,'N',T,
       '#',1.0,2.0,retSS,retrieveSS,11,0);
```

```
    END; { CASE }

    if varSS=screen_fieldSS then last_fieldSS:=TRUE;
    RET_STATUS; { Check the code in “retSS”. Set  “varSS” and “actionSS” }

{ Check to see whether to switch retrieveSS to true }
if last_fieldSS and (not retrieveSS) then
begin
    retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
end else
    last_fieldSS:=FALSE;

UNTIL actionSS=exitSS
END; { PROCEDURE SCREEN_2 }

VAR { Variables Section For C:INPUT11 }
      CR: STRING[1]; MCT: STRING[1]; VHFDF: STRING[1]; CCS: STRING[1];
      DESCRIBE2: STRING[47]; DESCRIBE3: STRING[65]; FA1: STRING[42];
      LOC3: STRING[18]; LOC4: STRING[65];

PROCEDURE INIT_VAR_3; { C:INPUT11 }
{ Initialize Variables To Default Values }
BEGIN
        CR:=’N’; MCT:=’N’; VHFDF:=’N’; CCS:=’N’; DESCRIBE2:=’’; DESCRIBE3:=’’;
        FA1:=’’; LOC3:=’’; LOC4:=’’;
END; { PROCEDURE INIT_VARS_3}

PROCEDURE SCREEN_3; { C:INPUT11 }
BEGIN

if screenSS<>3 then
begin
    screenSS:=3; screen_fieldSS:=9; varSS:=1;
    retrieveSS:=FALSE; last_fieldSS:=FALSE;
    DISPLAY_SCREEN(‘INPUT11.SCR’,file_existSS); { Display Screen }
    if not file_existSS then
    begin gotoxy(1,1); write(‘Missing Screen INPUT11’) end;
end;
retSS:=’’;

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
    CASE varSS of
1:  GETITEM(1,7,1,’Y’,CR,
        ‘U’,’’,’’,retSS,retrieveSS,11,0);
2:  GETITEM(33,7,1,’Y’,MCT,
        ‘U’,’’,’’,retSS,retrieveSS,11,0);
3:  GETITEM(1,8,1,’Y’,VHFDF,
        ‘U’,’’,’’,retSS,retrieveSS,11,0);
4:  GETITEM(15,8,1,’Y’,CCS,
        ‘U’,’’,’’,retSS,retrieveSS,11,0);
5:  GETITEM(19,9,47,’C’,DESCRIBE2,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
6:  GETITEM(1,10,65,’C’,DESCRIBE3,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
7:  GETITEM(24,12,42,’C’,FA1,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
```

```
8:  GETITEM(48,14,18,'C',LOC3,
        'XXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,i1,0));
9:  GETITEM(1,15,65,'C',LOC4,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
    END; { CASE }

    if varSS=screen_fieldSS then last_fieldSS:=TRUE;
    RET_STATUS; { Check the code in "retSS". Set  "varSS" and "actionSS" }

 { Check to see whether to switch retrieveSS to true }
 if last_fieldSS and (not retrieveSS) then
 begin
    retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
 end else
    last_fieldSS:=FALSE;

 UNTIL actionSS=exitSS
 END; { PROCEDURE SCREEN_3 }

 VAR { Variables Section For C:INPUT2 }
      AGC: STRING[1]; VOR: STRING[1]; ILS: STRING[1]; ADF:  STRING[1];
      DESCRIBE1: STRING[39]; DESCRIBE: STRING[67]; FA: STRING[44]; ID: STRING[39];
      AMT: STRING[44]; LOC2: STRING[67];

 PROCEDURE INIT_VAR_4; { C:INPUT2 }
 { Initialize Variables To Default Values }
 BEGIN
        AGC:='N'; VOR:='N'; ILS:='N'; ADF:='N'; DESCRIBE1:=''; DESCRIBE:='';
        FA:=''; ID:=''; AMT:=''; LOC2:='';
 END; { PROCEDURE INIT_VARS_4}

 PROCEDURE SCREEN_4; { C:INPUT2 }
 BEGIN

 if screenSS<>4 then
 begin
    screenSS:=4; screen_fieldSS:=10; varSS:=1;
    retrieveSS:=FALSE; last_fieldSS:=FALSE;
    DISPLAY_SCREEN('INPUT2.SCR',file_existSS);  { Display Screen }
    if not file_existSS then
    begin gotoxy(1,1); write('Missing Screen INPUT2') end;
 end;
 retSS:='';

 { Display Items. Change retrieveSS to TRUE and INPUT items}
 REPEAT { until actionSS = exitSS }
    CASE varSS of
 1:  GETITEM(1,5,1,'Y',AGC,
         'U','','',retSS,retrieveSS,11,0);
 2:  GETITEM(1,6,1,'Y',VOR,
         'U','','',retSS,retrieveSS,11,0);
 3:  GETITEM(1,7,1,'Y',ILS,
         'U','','',retSS,retrieveSS,11,0);
 4:  GETITEM(1,8,1,'Y',ADF,
        ‘U’,’’,’’,retSS,retrieveSS,11,0);
5:  GETITEM(29,9,39,’C’,DESCRIBE1,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
6:  GETITEM(1,10,67,’C’,DESCRIBE,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
7:  GETITEM(24,12,44,’C’,FA,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
8:  GETITEM(29,14,39,’C’,ID,
        ‘UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU’,’’,’’,retSS,retrieveSS,11,0);
9:  GETITEM(24,16,44,’C’,AMT,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
10:  GETITEM(1,19,67,’C’,LOC2,
        ‘XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX’,’’,’’,retSS,retrieveSS,11,0);
   END; { CASE }

   if varSS=screen_fieldSS then last_fieldSS:=TRUE;
   RET_STATUS; { Check the code in “retSS”. Set  “varSS” and “actionSS” }

{ Check to see whether to switch retrieveSS to true }
if last_fieldSS and (not retrieveSS) then
begin
   retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
end else
   last_fieldSS:=FALSE;

UNTIL actionSS=exitSS
END; { PROCEDURE SCREEN_4 }

VAR { Variables Section For C:INPUT3 }
     INTERTYPE1: STRING[28]; INTERTYPE2: STRING[64]; INTERTYPE3: STRING[64];
     OFTEN: REAL; DURATION: REAL; EFFECT: REAL; DATEINTER: STRING[8];
     TIMEINTER: REAL; CAUSE: STRING[63]; COMMENT1: STRING[52];
     COMMENT2: STRING[64]; COMMENT3: STRING[64];

PROCEDURE INIT_VAR_5; { C:INPUT3 }
{ Initialize Variables To Default Values }
BEGIN
       INTERTYPE1:=’’; INTERTYPE2:=’’; INTERTYPE3:=’’; OFTEN:=1; DURATION:=1;
       EFFECT:=1; DATEINTER:=’  /  /’; TIMEINTER:=0; CAUSE:=’’; COMMENT1:=’’;
       COMMENT2:=’’; COMMENT3:=’’;
END; { PROCEDURE INIT_VARS_5}

PROCEDURE SCREEN_5; { C:INPUT3 }
BEGIN

if screenSS<>5 then
begin
   screenSS:=5; screen_fieldSS:=12; varSS:=1;
   retrieveSS:=FALSE; last_fieldSS:=FALSE;
   DISPLAY_SCREEN(‘INPUT3.SCR’,file_existSS);  { Display Screen }
   if not file_existSS then
   begin gotoxy(1,1); write(‘Missing Screen INPUT3’) end;
end;
retSS:=’’;

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
```

```
   CASE varSS of
1:  GETITEM(37,3,28,'C',INTERTYPE1,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
2:  GETITEM(1,4,64,'C',INTERTYPE2,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
3:  GETITEM(1,5,64,'C',INTERTYPE3,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
4:  GETNUM(55,8,1,'N',OFTEN,
       '#',1.0,4.0,retSS,retrieveSS,11,0);
5:  GETNUM(57,11,1,'N',DURATION,
       '#',1.0,4.0,retSS,retrieveSS,11,0);
6:  GETNUM(48,14,1,'N',EFFECT,
       '#',1.0,3.0,retSS,retrieveSS,11,0);
7:  GETITEM(6,17,8,'D',DATEINTER,
       '88/88/88',' / / ',' / / ',retSS,retrieveSS,11,0);
8:  GETNUM(26,17,4,'N',TIMEINTER,
       '####',0.0,2400.0,retSS,retrieveSS,11,0);
9:  GETITEM(1,20,63,'C',CAUSE,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
10:  GETITEM(13,22,52,'C',COMMENT1,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
11:  GETITEM(1,23,64,'C',COMMENT2,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
12:  GETITEM(1,24,64,'C',COMMENT3,
       'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
    END; { CASE }

    if varSS=screen_fieldSS then last_fieldSS:=TRUE;
    RET_STATUS; { Check the code in "retSS". Set  "varSS" and "actionSS" }

 { Check to see whether to switch retrieveSS to true }
 if last_fieldSS and (not retrieveSS) then
 begin
    retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
 end else
    last_fieldSS:=FALSE;

 UNTIL actionSS=exitSS
 END; { PROCEDURE SCREEN_5 }

 PROCEDURE UPDOWN;
 { Will set 'use_screenSS' to the next screen to display }
 { Depending on the key pressed at the prompt.
    If key pressed is Page Up or Page Down then the 'use_screenSS' is
       incremented or decremented.
    If the key pressed is Esc then 'use_screenSS' is set to 0.
    If any other key pressed then 'use_screenSS' remains the same
       but 'retSS' is set to an Up Arrow Key.(uSS) }
 VAR answerSS: STRING[1]; blank_lineSS: STRING[76];
 BEGIN
    color(7,0); gotoxy(1,25);
    { Prompt User }
    write('[PgDn] - next, [Esc] to exit, Any Other To Stay.');
    answerSS:=blankSS;
    GETITEM(75,25,1,'C',answerSS,'U','','',retSS,TRUE,7,0);
    fillchar(blank_lineSS[1], 76, ' '); blank_lineSS[0]:=chr(76);
    gotoxy(1,25); write(blank_lineSS);
   if ord(retSS[0])=2 then
   begin
      if (retSS[2]=puSS) or (retSS[2]=pdSS) then
         retSS:=retSS[2]
      else
         retSS:=blankSS;
   end else
      if retSS<>escSS then retSS:=blankSS;
   CASE retSS[1] of
      puSS: use_screenSS:=use_screenSS-1;
      pdSS: use_screenSS:=use_screenSS+1;
      blankSS: begin retSS[0]:=chr(2); retSS[1]:=chr(0); retSS[2]:=uSS end;
      escSS: use_screenSS:=0 ;
   END;
END; { PROCEDURE UPDOWN }

BEGIN { Main Test Program }
   vtypeSS:=SET_MONITOR_TYPE; { 2=Color, 3=Mono }
   screenSS:=0; use_screenSS:=1; BeepOnSS:=FALSE;
   INIT_VAR_1; { C:INPUT }
   INIT_VAR_2; { C:INPUT1 }
   INIT_VAR_3; { C:INPUT11 }
   INIT_VAR_4; { C:INPUT2 }
   INIT_VAR_5; { C:INPUT3 }

{the following section sets the order of the screens}
{and has been changed so the program stops}
{if the user presses return on the first screen}

REPEAT

   CASE use_screenSS of
 1: begin
            SCREEN_1; { C:INPUT }
            If indicator = ''
            then use_screenSS:=6
            else use_screenSS:= use_screenSS+1;
        end;
 2: begin
            if (indicator <> '')
            THEN
            BEGIN
            SCREEN_2; { C:INPUT1 }

            UPDOWN; { Ask which way to go }
            END
              ELSE
                use_screenSS:=0;
        end;

3: begin
            If (T = 1)
            THEN
              BEGIN


            SCREEN_3; { C:INPUT11 }
```

```
               UPDOWN; { Ask which way to go }
                 END
               ELSE
                   use_screenSS:=use_screenSS+1;
          end;

 4: begin
               If (T = 2)
               THEN
                 BEGIN

               SCREEN_4; { C:INPUT2 }

               UPDOWN; { Ask which way to go }
               END
                     ELSE
                     use_screenSS:=use_screenSS+1;
               end;
   5: begin
                If  (indicator <> ‘’)
                THEN
                  BEGIN

                SCREEN_5; { C:INPUT3 }

                UPDOWN; { Ask which way to go }
              END
                    ELSE
                      use_screenSS:=0;
         end;
     ELSE
           use_screenSS:=0;
     END; { CASE }

  UNTIL use_screenSS=0;

  If  (indicator <> ‘’)
  THEN
  Begin

  {the following section makes sure the disk is ready}

  ClrScr;
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘    ’);
  Writeln(‘      ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::’);
  Writeln(‘      :  Please ensure that your session disk is in drive A  :’);
  Writeln(‘      :  in order to save the report.                        :’);
  Writeln(‘      :                                                      :’);
```

```
Writeln('      :   Press -> 1. to continue (disk ready)          :');
Writeln('      :              2. to abort (disk not available)      :');
Writeln('      ::::::::::::::::::::::::::::::::::::::::::::::::::::::::');

Read(kbd,key);


If key = '1'
THEN
Begin

{The following section opens the data file and prints the data}
{in the report form}

Assign(temp,'a:emi.dat');
Rewrite(temp);
Writeln(temp, '         Transport   Transports');
Writeln(temp, '         Canada      Canada');
Writeln(temp);
Writeln(temp,'                 ELECTROMAGNETIC INTERFERENCE (EMI) REPORT');
WRITELN(temp);
WRITELN(temp,'          SITE:  ',SITE,'        PREPARED BY: ',PREPAREDBY);
IF FACILITY = 1 then
Writeln(temp,'         FACILITY: FSS');
IF FACILITY = 2 then
Writeln(temp,'         FACILITY: ATS');

Writeln(temp,'            TELEPHONE NO.:  (',TELEPHONEA,') ',TELEPHONEB,'-',TELEPHONEC,'     EXT.
',TELEPHONED);
WRITELN(temp,'          DATE: ',DATE);
WRITELN(temp);

Writeln(temp,'         SECTION 1 - Interference to GROUND BASED Electronics Equipment');
Writeln(temp);
Writeln(temp,'          (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:');
IF CR = 'Y' then
Write  (temp,'          COMMUNICATIONS RECEIVER');
IF MCT = 'Y' then
Writeln(temp,'           MULTI-CHANNEL RECEIVER');
IF VHFDF = 'Y' then
Write  (temp,'           VHF-DF');
IF CCS = 'Y' then
Writeln(temp,'           COMMUNICATIONS CONTROL SYSTEM (CCS)');
Writeln(temp,'         OTHER EQUIPMENT: ', DESCRIBE2);
Writeln(temp,'          ',DESCRIBE3);
Writeln(temp,'         (b) FREQUENCY AFFECTED: ',FA1);
Writeln(temp,'         (c) LOCATION OF AFFECTED ELECTRONICS EQUIPMENT: ');
Writeln(temp,'           ',LOC3);
Writeln(temp,'           ',LOC4);
WRITELN(temp);
Writeln(temp,'         SECTION 2 - Interference to AIRBORNE Electronics Equipment');
Writeln(temp);
Writeln(temp,'          (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:');
IF AGC = 'Y' then
WRITE  (temp,'             AIR/GROUND COMMUNICATIONS');
IF VOR = 'Y' then
Writeln(temp,'           VOR');
```

```
IF ILS = 'Y' then
Write  (temp,'              ILS');
IF ADF = 'Y' then
WRITELN(temp,'                 ADF');
Writeln(temp,'             OTHER EQUIPMENT: ',DESCRIBE1);
Writeln(temp,'               ',DESCRIBE);
Writeln(temp,'             (b) FREQUENCY AFFECTED: ',FA);
Writeln(temp,'             (c) AIRCRAFT IDENTIFICATION:',ID);
Writeln(temp,'             (d) AIRCRAFT MAKE/TYPE: ',AMT);
Writeln(temp,'             (e) LOCATION AND ALTITUDE WHEN INTERFERENCE WAS EXPERIENCED:');
Writeln(temp,'               ',LOC2);
WRITELN(temp);
Writeln(temp,'             SECTION 3 - Description of Interference');
Writeln(temp);
Writeln(temp,'             (a) DESCRIBE TYPE OF INTERFERENCE:');
Writeln(temp,'               ',INTERTYPE1);
Writeln(temp,'               ',INTERTYPE2);
Writeln(temp,'               ',INTERTYPE3);
                               IF OFTEN = 1 then
Writeln(temp,'             (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: First Time');
                               IF OFTEN = 2 then
Writeln(temp,'             (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Occasionally');
                               IF OFTEN = 3 then
Writeln(temp,'             (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Often');
                               IF OFTEN = 4 then
Writeln(temp,'             (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Continuously');
                               IF DURATION = 1 then
Writeln(temp,'             (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Seconds');
                               IF DURATION = 2 then
Writeln(temp,'             (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Minutes');
                               IF DURATION = 3 then
Writeln(temp,'             (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Hours');
                               IF DURATION = 4 then
Writeln(temp,'             (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Days');
                               IF EFFECT = 1 then
Writeln(temp,'             (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable');
                               IF EFFECT = 2 then
Writeln(temp,'             (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable with difficulty');
                               IF EFFECT = 3 then
Writeln(temp,'             (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Unusable');
Writeln(temp,'             (e) DATE AND TIME OF REPORTED INTERFERENCE:');

Writeln(temp,'               ',DATEINTER,'       ',TIMEINTER:4:0,' (Z)');
Writeln(temp,'             (f) IF POSSIBLE, IDENTIFY PROBABLE CAUSE OF THIS INTERFERENCE:');
Writeln(temp,'               ',CAUSE);
Writeln(temp,'             (g) COMMENTS:');
Writeln(temp,'               ',COMMENT1);
Writeln(temp,'               ',COMMENT2);
Writeln(temp,'               ',COMMENT3);

Close(temp);
End;
End;

If (indicator <> '')
THEN
```

```
Begin

{the following section makes sure the printer is ready}

ClrScr;
Writeln(‘    ’);
Writeln(‘      ********************************************************’);
Writeln(‘      *   Please ensure your printer is connected        *’);
Writeln(‘      *   in order to print out the reports.           *’);
Writeln(‘      *                                            *’);
Writeln(‘      *   Press -> 1. to continue (printer ready)        *’);
Writeln(‘      *            2. to abort (printer not available)   *’);
writeln(‘      ********************************************************’);

Read(kbd,key);


{after closing the file we print out the data in the format}
{resembling the report}

If key = ‘1’
THEN
Begin
Writeln(LST, ‘         Transport   Transports’);
Writeln(LST, ‘         Canada      Canada’);
Writeln(LST);
Writeln(LST,’                   ELECTROMAGNETIC INTERFERENCE (EMI) REPORT’);
WRITELN(LST);
WRITELN(LST,’           SITE:  ‘,SITE,’        PREPARED BY: ‘,PREPAREDBY);
IF FACILITY = 1 then
Writeln(LST,’          FACILITY: FSS’);
IF FACILITY = 2 then
Writeln(LST,’          FACILITY: ATS’);

Writeln(LST,’              TELEPHONE  NO.:  (‘,TELEPHONEA,’) ‘,TELEPHONEB,’-’,TELEPHONEC,’    EXT.
‘,TELEPHONED);
WRITELN(LST,’           DATE: ‘,DATE);
WRITELN(LST);
IF T=1 THEN
BEGIN
Writeln(LST,’          SECTION 1 - Interference to GROUND BASED Electronics Equipment’);
Writeln(LST);
Writeln(LST,’           (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:’);
IF CR = ‘Y’ then
Write  (LST,’           COMMUNICATIONS RECEIVER’);
IF MCT = ‘Y’ then
Writeln(LST,’            MULTI-CHANNEL RECEIVER’);
IF VHFDF = ‘Y’ then
Write  (LST,’            VHF-DF’);
IF CCS = ‘Y’ then
Writeln(LST,’            COMMUNICATIONS CONTROL SYSTEM (CCS)’);
Writeln(LST,’          OTHER EQUIPMENT: ‘, DESCRIBE2);
Writeln(LST,’            ‘,DESCRIBE3);
Writeln(LST,’          (b) FREQUENCY AFFECTED: ‘,FA1);
Writeln(LST,’          (c) LOCATION OF AFFECTED ELECTRONICS EQUIPMENT: ‘);
Writeln(LST,’            ‘,LOC3);
Writeln(LST,’            ‘,LOC4);
```

```
END;
IF T=2 THEN
BEGIN
WRITELN(LST);
Writeln(LST,'          SECTION 2 - Interference to AIRBORNE Electronics Equipment');
Writeln(LST);
Writeln(LST,'           (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:');
IF AGC = 'Y' then
WRITE  (LST,'              AIR/GROUND COMMUNICATIONS');
IF VOR = 'Y' then
Writeln(LST,'            VOR');
IF ILS = 'Y' then
Write  (LST,'            ILS');
IF ADF = 'Y' then
WRITELN(LST,'                ADF');
Writeln(LST,'          OTHER EQUIPMENT: ',DESCRIBE1);
Writeln(LST,'            ',DESCRIBE);
Writeln(LST,'          (b) FREQUENCY AFFECTED: ',FA);
Writeln(LST,'          (c) AIRCRAFT IDENTIFICATION:',ID);
Writeln(LST,'          (d) AIRCRAFT MAKE/TYPE: ',AMT);
Writeln(LST,'          (e) LOCATION AND ALTITUDE WHEN INTERFERENCE WAS EXPERIENCED:');
Writeln(LST,'            ',LOC2);
WRITELN(LST);
END;
Writeln(LST,'          SECTION 3 - Description of Interference');
Writeln(LST);
Writeln(LST,'          (a) DESCRIBE TYPE OF INTERFERENCE:');
Writeln(LST,'            ',INTERTYPE1);
Writeln(LST,'            ',INTERTYPE2);
Writeln(LST,'            ',INTERTYPE3);
                          IF OFTEN = 1 then
Writeln(LST,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: First Time');
                          IF OFTEN = 2 then
Writeln(LST,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Occasionally');
                          IF OFTEN = 3 then
Writeln(LST,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Often');
                          IF OFTEN = 4 then
Writeln(LST,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Continuously');
                          IF DURATION = 1 then
Writeln(LST,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Seconds');
                          IF DURATION = 2 then
Writeln(LST,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Minutes');
                          IF DURATION = 3 then
Writeln(LST,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Hours');
                          IF DURATION = 4 then
Writeln(LST,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Days');
                          IF EFFECT = 1 then
Writeln(LST,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable');
                          IF EFFECT = 2 then
Writeln(LST,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable with difficulty');
                          IF EFFECT = 3 then
Writeln(LST,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Unusable');
Writeln(LST,'          (e) DATE AND TIME OF REPORTED INTERFERENCE:');

Writeln(LST,'            ',DATEINTER,'        ',TIMEINTER:4:0,' (Z)');
Writeln(LST,'          (f) IF POSSIBLE, IDENTIFY PROBABLE CAUSE OF THIS INTERFERENCE:');
Writeln(LST,'            ',CAUSE);
Writeln(LST,'          (g) COMMENTS:');
Writeln(LST,'           ',COMMENT1);
Writeln(LST,'           ',COMMENT2);
Writeln(LST,'           ',COMMENT3);

Writeln(LST, CHR(12));

END;
END;


END. { PROGRAM C:REPORT1.PAS }
```

REPORT2.PAS

```
PROGRAM REPORT2(INPUT,OUTPUT);
{Procedures Generated By Screen Sculptor,Version 1.2 2/22/1988 - 10:35:29 }
CONST CopyrightSS='(C)Copyright 84,85 The Software Bottling Company Of New York';
{   DO NOT REMOVE The Above Copyright Notice
        This Program may not be used without the above Copyright Notice
}
{  SCREEN SCULPTOR(C) Version 1.2
     (C) COPYRIGHT, THE SOFTWARE BOTTLING COMPANY OF NEW YORK, 1984, 1985
     WARNING: Do not attempt to make any changes to this procedure unless you
     have made a backup. The Software Bottling Company Of New York can not
     and will not support such changes made to this program.
     Turbo(tm) Pascal Version, Trade Mark Of Borland International}

{ Global Required Definition of variables and constants }

TYPE  STR2 = STRING[2]; STR80 = STRING[80]; STR79 = STRING[79];
          resSS = (staySS, prevSS, exitSS, nextSS);

CONST { Esc, Up Arrow Key, Left Arrow Key , Page Up Key       }
          escSS=#27;   uSS='H'; lSS='K'; puSS='I';
          { Blank, Down Arrow Key, Right Arrow Key, Page Down Key }
          blankSS=' ‘; dSS='P'; rSS='M'; pdSS='Q';
          { Function keys  F1-F10 }
          f1SS=';'; f2SS='<'; f3SS='='; f4SS='>'; f5SS='?';
          f6SS='@'; f7SS='A'; f8SS='B'; f9SS='C'; f10SS='D';
          retSS : STR2='';

VAR   actionSS, last_field_actionSS : resSS;
          hiSS, loSS : REAL;
          vtypeSS, screenSS, use_screenSS, screen_fieldSS, varSS : INTEGER;
          file_existSS, last_fieldSS, retrieveSS : BOOLEAN;
          rangeSS : STR80;
          BeepOnSS: BOOLEAN;

temp:text;
x,key:char;

{$V-,C-,R-} { Pascal Directives. See Compiler Manual }
{$I TURPROCS.TUR  Include Procedures In This File. See Manual }

(*  This is a summary of the procedures in TURPROCS.TUR

PROCEDURE BEEP(BeepOn: BOOLEAN);           { Sound Beep if BeepOn=TRUE }
PROCEDURE CLEAR_KBD;                       { Clear Keyboard Buffer }
PROCEDURE COLOR(foregr,backgr:BYTE);          { Set Color }
PROCEDURE WRITEC(vtext: STR80);            { Write Chars Using Color }
FUNCTION  SET_MONITOR_TYPE: INTEGER;          { Determine Monitor Type }
{ Display A Screen Sculptor Screen }         { 2=Color, 3=Mono }
PROCEDURE DISPLAY_SCREEN(screen_name: STR80; VAR file_existSS: BOOLEAN);
{ Display And Get An Item From Screen. See Detailed Desription In Manual }
PROCEDURE GETITEM(
                        COL,LIN,LEN :      BYTE;    { Column, Line, Length }
                        ITYPE :            CHAR;    { Type= C, N, D, Y, M  }
                    VAR WITEM :            STR80;   { Variable Name        }
                    PICT :              STR80;   { Picture X, U, L, 9, 8 # }
                    ITEM_LOW,ITEM_HIGH : STR80;  { Range - Numerics/Date Only}
                VAR RET :               STR2;    { Returned Code        }
                    RETRIEVE :          BOOLEAN; { False=Disp Only, True=Get }
                    FGR_COLOR,BGR_COLOR : BYTE    { Colors Foregr, Backgr }
                    ); EXTERN;

*)

PROCEDURE RET_STATUS;
{ Check Status Of Variable retSS and return a code in 'actionSS' & set 'varSS'
  This procedure is called immediately following GETITEM }

{ Input to this procedure:
  when retSS is length 1 the values are any of the ASCII chars
  when retSS is length 2 the values are uSS, lSS, puSS, pdSS, function keys
                                                          dSS, rSS
                                                          ( See CONST Section For Meanings ) }
{ Output:
  The following codes are returned in actionSS : nextSS, prevSS,
                                                                      exitSS, staySS }
{ Based upon 'actionSS' this procedure will then set 'varSS' to an integer,
  which represents the next item (variable ) to get.  }
BEGIN
  last_field_actionSS:=exitSS;
  actionSS:=nextSS; { Initialize Action Code }
  if retrieveSS then { Is retrieveSS TRUE? }
  begin
    if ord(retSS[0])=2 then { Is retSS length 2 ? }
    begin
      CASE retSS[2] of
      { Action to be taken depending on the last key pressed }
        uSS, lSS: actionSS:=prevSS;  { Up Key, Left Key }
        dSS, rSS: actionSS:=nextSS;  {Down Key, Right Key}
        puSS: actionSS:= { Page Up   }staySS;
        pdSS: actionSS:= { Page Down }staySS;
        f1SS,f2SS,f3SS,f4SS,f5SS,
        f6SS,f7SS,f8SS,f9SS,f10SS: actionSS:=staySS; { Function Key }
      END { Case ret };
    end else { retSS is length 1 }
    begin
      if retSS=escSS { Escape Key } then actionSS:=staySS
    end;
  { Any other key not in the above list will keep actionSS=nextSS }
  end; {retrieveSS}
  CASE actionSS of
    staySS: ;
    nextSS: begin
              varSS:=varSS+1; if varSS>screen_fieldSS then varSS:=1;
              if last_fieldSS and retrieveSS then actionSS:=last_field_actionSS
            end;
    prevSS: begin varSS:=varSS-1; if varSS<1 then varSS:=screen_fieldSS end;
    exitSS: ;
  END; { CASE }
END; {PROCEDURE RET_STATUS}

PROCEDURE GETNUM(
                    COL,LIN,LEN :       BYTE;    { Column, Line, Length }
                    ITYPE :             CHAR;    { Type= C, N, D, Y, M  }
                VAR WITEM :             REAL;    { Numerci Variable Name }
                    PICT :              STR80;   { Picture X, U, L, 9, 8 # }
                    ITEM_LOW,ITEM_HIGH :  REAL;    { Range - Numerics/Date Only}
                VAR RET :               STR2;    { Returned Code        }
                    RETRIEVE :          BOOLEAN;  { False=Disp Only, True=Get }
                    FGR_COLOR,BGR_COLOR : BYTE     { Colors Foregr, Backgr }
                    );
{ This Procedure converts numeric to string before calling GETITEM }
{ It then converts the result back to numeric }
VAR numSS,numloSS,numhiSS: STR80; errorcodeSS,dec_posSS: INTEGER;
BEGIN
   { Get # of Decimal Positions }
   dec_posSS:=ord(pict[0])-pos('.',pict);
   { Convert item, low and high range to string }
   STR(witem:0:dec_posSS,numSS);
   STR(item_low:0:dec_posSS,numloSS);
   STR(item_high:0:dec_posSS,numhiSS);
   GETITEM(col,lin,len,itype,numSS,pict,numloSS,numhiSS,
           ret,retrieve,fgr_color,bgr_color);
   { Convert string to numeric item }
   VAL(numSS, witem, errorcodeSS);
END; { GETNUM }


VAR { Variables Section For C:INPUTB1 }
     REGION: STRING[59]; SITE: STRING[61]; PREPAREDBY: STRING[22];
     DESIGNTOR: STRING[20]; DATEP: STRING[8]; TELEPHONE1: STRING[3];
     TELEPHONE2: STRING[3]; TELEPHONE3: STRING[4]; TELEPHONE4: STRING[4];
     DATEI: STRING[8]; PROBLEM1: STRING[46]; PROBLEM2: STRING[66];
     PROBLEM3: STRING[66]; PROBLEM4: STRING[66]; CAUSE1: STRING[49];
     CAUSE2: STRING[66]; CAUSE3: STRING[66]; CAUSE4: STRING[66];
     CORRECTIVE1: STRING[48]; CORRECTIVE2: STRING[66]; CORRECTIVE3: STRING[66];
     CORRECTIVE4: STRING[66];

PROCEDURE INIT_VAR_1; { C:INPUTB1 }
{ Initialize Variables To Default Values }
BEGIN
       REGION:=''; SITE:=''; PREPAREDBY:=''; DESIGNTOR:=''; DATEP:='  /  /';
       TELEPHONE1:='';  TELEPHONE2:='';  TELEPHONE3:='';  TELEPHONE4:='';
       DATEI:='  /  /'; PROBLEM1:=''; PROBLEM2:=''; PROBLEM3:=''; PROBLEM4:='';
       CAUSE1:=''; CAUSE2:=''; CAUSE3:=''; CAUSE4:=''; CORRECTIVE1:='';
       CORRECTIVE2:=''; CORRECTIVE3:=''; CORRECTIVE4:='';
END; { PROCEDURE INIT_VARS_1}

PROCEDURE SCREEN_1; { C:INPUTB1 }
BEGIN

if screenSS<>1 then
begin
   screenSS:=1; screen_fieldSS:=22; varSS:=1;
   retrieveSS:=FALSE;  last_fieldSS:=FALSE;
   DISPLAY_SCREEN('INPUTB1.SCR',file_existSS);  { Display Screen }
   if not file_existSS then
   begin gotoxy(1,1); write('Missing Screen INPUTB1') end;
end;
```

```
retSS:='';

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
    CASE varSS of
1:  GETITEM(8,7,59,'C',REGION,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
2:  GETITEM(6,8,61,'C',SITE,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
3:  GETITEM(13,9,22,'C',PREPAREDBY,
        'XXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
4:  GETITEM(47,9,20,'C',DESIGNTOR,
        'UUUUUUUUUUUUUUUUUUUU','','',retSS,retrieveSS,11,0);
5:  GETITEM(27,10,8,'D',DATEP,
        '88/88/88',' / / ',' / / ',retSS,retrieveSS,11,0);
6:  GETITEM(43,10,3,'C',TELEPHONE1,
        '888','','',retSS,retrieveSS,11,0);
7:  GETITEM(48,10,3,'C',TELEPHONE2,
        '888','','',retSS,retrieveSS,11,0);
8:  GETITEM(52,10,4,'C',TELEPHONE3,
        '8888','','',retSS,retrieveSS,11,0);
9:  GETITEM(62,10,4,'C',TELEPHONE4,
        '8888','','',retSS,retrieveSS,11,0);
10:  GETITEM(34,11,8,'D',DATEI,
        '88/88/88',' / / ',' / / ',retSS,retrieveSS,11,0);
11:  GETITEM(21,12,46,'C',PROBLEM1,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
12:  GETITEM(1,13,66,'C',PROBLEM2,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
13:  GETITEM(1,14,66,'C',PROBLEM3,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
14:  GETITEM(1,15,66,'C',PROBLEM4,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
15:  GETITEM(18,16,49,'C',CAUSE1,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
16:  GETITEM(1,17,66,'C',CAUSE2,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
17:  GETITEM(1,18,66,'C',CAUSE3,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
18:  GETITEM(1,19,66,'C',CAUSE4,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
19:  GETITEM(19,20,48,'C',CORRECTIVE1,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
20:  GETITEM(1,21,66,'C',CORRECTIVE2,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
21:  GETITEM(1,22,66,'C',CORRECTIVE3,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
22:  GETITEM(1,23,66,'C',CORRECTIVE4,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
    END; { CASE }

    if varSS=screen_fieldSS then last_fieldSS:=TRUE;
    RET_STATUS; { Check the code in "retSS". Set  "varSS" and "actionSS" }

{ Check to see whether to switch retrieveSS to true }
if last_fieldSS and (not retrieveSS) then
begin
    retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
end else
```

```
    last_fieldSS:=FALSE;

UNTIL actionSS=exitSS
END; { PROCEDURE SCREEN_1 }

VAR { Variables Section For C:INPUTB2 }
     COMMENT1: STRING[57]; COMMENT2: STRING[66]; COMMENT3: STRING[66];
     COMMENT4: STRING[66]; COMMENT5: STRING[66]; COMMENT6: STRING[66];
     COMMENT7: STRING[66]; COMMENT8: STRING[66]; COMMENT9: STRING[66];
     COMMENT10: STRING[66]; COMMENT11: STRING[66]; COMMENT12: STRING[66];

PROCEDURE INIT_VAR_2; { C:INPUTB2 }
{ Initialize Variables To Default Values }
BEGIN
       COMMENT1:=''; COMMENT2:=''; COMMENT3:=''; COMMENT4:=''; COMMENT5:='';
       COMMENT6:=''; COMMENT7:=''; COMMENT8:=''; COMMENT9:=''; COMMENT10:='';
       COMMENT11:=''; COMMENT12:='';
END; { PROCEDURE INIT_VARS_2}

PROCEDURE SCREEN_2; { C:INPUTB2 }
BEGIN

if screenSS<>2 then
begin
   screenSS:=2; screen_fieldSS:=12; varSS:=1;
   retrieveSS:=FALSE; last_fieldSS:=FALSE;
   DISPLAY_SCREEN('INPUTB2.SCR',file_existSS);  { Display Screen }
   if not file_existSS then
   begin gotoxy(1,1); write('Missing Screen INPUTB2') end;
end;
retSS:='';

{ Display Items. Change retrieveSS to TRUE and INPUT items}
REPEAT { until actionSS = exitSS }
   CASE varSS of
1:  GETITEM(10,1,57,'C',COMMENT1,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
2:  GETITEM(1,2,66,'C',COMMENT2,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
3:  GETITEM(1,3,66,'C',COMMENT3,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
4:  GETITEM(1,4,66,'C',COMMENT4,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
5:  GETITEM(1,5,66,'C',COMMENT5,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
6:  GETITEM(1,6,66,'C',COMMENT6,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
7:  GETITEM(1,7,66,'C',COMMENT7,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
8:  GETITEM(1,8,66,'C',COMMENT8,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
9:  GETITEM(1,9,66,'C',COMMENT9,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
10:  GETITEM(1,10,66,'C',COMMENT10,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
11:  GETITEM(1,11,66,'C',COMMENT11,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
12:  GETITEM(1,12,66,'C',COMMENT12,
        'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX','','',retSS,retrieveSS,11,0);
    END; { CASE }

    if varSS=screen_fieldSS then last_fieldSS:=TRUE;
    RET_STATUS; { Check the code in "retSS". Set  "varSS" and "actionSS" }

{ Check to see whether to switch retrieveSS to true }
if last_fieldSS and (not retrieveSS) then
begin
    retrieveSS:=TRUE; last_fieldSS:=FALSE; actionSS:=staySS; varSS:=1;
end else
    last_fieldSS:=FALSE;

UNTIL actionSS=exitSS
END; { PROCEDURE SCREEN_2 }

PROCEDURE UPDOWN;
{ Will set 'use_screenSS' to the next screen to display }
{ Depending on the key pressed at the prompt.
    If key pressed is Page Up or Page Down then the 'use_screenSS' is
        incremented or decremented.
    If the key pressed is Esc then 'use_screenSS' is set to 0.
    If any other key pressed then 'use_screenSS' remains the same
        but 'retSS' is set to an Up Arrow Key.(uSS) }
VAR answerSS: STRING[1]; blank_lineSS: STRING[76];
BEGIN
    color(7,0); gotoxy(1,25);
    { Prompt User }
    write('[PgDn], [PgUp] - next, previous screen, [Esc] to exit, Any Other To Stay.');
    answerSS:=blankSS;
    GETITEM(75,25,1,'C',answerSS,'U','','',retSS,TRUE,7,0);
    fillchar(blank_lineSS[1], 76, ' '); blank_lineSS[0]:=chr(76);
    gotoxy(1,25); write(blank_lineSS);
    if ord(retSS[0])=2 then
    begin
        if (retSS[2]=puSS) or (retSS[2]=pdSS) then
            retSS:=retSS[2]
        else
            retSS:=blankSS;
    end else
        if retSS<>escSS then retSS:=blankSS;
    CASE retSS[1] of
        puSS: use_screenSS:=use_screenSS-1;
        pdSS: use_screenSS:=use_screenSS+1;
        blankSS: begin retSS[0]:=chr(2); retSS[1]:=chr(0); retSS[2]:=uSS end;
        escSS: use_screenSS:=0 ;
    END;
END; { PROCEDURE UPDOWN }

BEGIN { Main Test Program }
CLRSCR;

    vtypeSS:=SET_MONITOR_TYPE; { 2=Color, 3=Mono }
    screenSS:=0; use_screenSS:=1; BeepOnSS:=FALSE;
    INIT_VAR_1; { C:INPUTB1 }
    INIT_VAR_2; { C:INPUTB2 }
```

```
REPEAT

   CASE use_screenSS of
  1:  begin
               SCREEN_1; { C:INPUTB1 }
               UPDOWN; { Ask which way to go }
          end;
  2:  begin
               SCREEN_2; { C:INPUTB2 }
               UPDOWN; { Ask which way to go }
          end;
    ELSE
          use_screenSS:=0;
    END; { CASE }

 UNTIL use_screenSS=0;

 {in the main program the variable BeepOnSS should be changed to FALSE}

 {The rest of this code is to be added before the last line}
 {of the main program Report2.pas and after the line}
 {UNTIL use_ScreenSS=0;}
 {then recompile into a command file}


 {check that the disk is ready}
 ClrScr;
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);
 Writeln(‘   ’);

 Writeln(‘        :::::::::::::::::::::::::::::::::::::::::::::::::::::::’);
 Writeln(‘        :  Please ensure that your session disk is in drive A  :’);
 Writeln(‘        :  in order to save the report.                        :’);
 Writeln(‘        :                                                     :’);
 Writeln(‘        :    Press -> 1. to continue (disk ready)              :’);
 Writeln(‘        :             2. to abort (disk not available)        :’);
 writeln(‘        :::::::::::::::::::::::::::::::::::::::::::::::::::::::’);

 Read(kbd,key);


 If key = ‘1’
 THEN
 Begin

 {open data file and write data in report form}

 assign(temp,’a:emil.dat’);
 rewrite (temp);
```

```
Writeln(temp,'     Transport    Transports');
Writeln(temp,'     Canada       Canada');
Writeln(temp);
Writeln (temp,'                  EMI CASE HISTORY');
Writeln (temp);
Writeln (temp,'        REGION: ',REGION);
Writeln (temp,'         SITE: ',SITE);
Writeln (temp,'        PREPARED BY: ',PREPAREDBY, ' DESIGNATOR: ',DESIGNTOR);
Writeln (temp,'        DATE PREPARED: ',DATEP);
WRITELN(temp,'                    TELEPHONE:  (',TELEPHONE1,')       ',TELEPHONE2,'-',TELEPHONE3,'EXT.
',TELEPHONE4);
Writeln (temp,'        DATE OF INTERFERENCE: ',DATEI);
Writeln (temp,'        PROBLEM DESCRIPTION: ',PROBLEM1);
Writeln (temp,'          ',PROBLEM2);
Writeln (temp,'          ',PROBLEM3);
Writeln (temp,'          ',PROBLEM4);
Writeln (temp,'        CAUSE IDENTIFIED: ',CAUSE1);
Writeln (temp,'          ',CAUSE2);
Writeln (temp,'          ',CAUSE3);
Writeln (temp,'          ',CAUSE4);
Writeln (temp,'        CORRECTIVE ACTION: ',CORRECTIVE1);
Writeln (temp,'          ',CORRECTIVE2);
Writeln (temp,'          ',CORRECTIVE3);
Writeln (temp,'          ',CORRECTIVE4);
Writeln (temp,'        COMMENTS: ',COMMENT1);
Writeln (temp,'          ',COMMENT2);
Writeln (temp,'          ',COMMENT3);
Writeln (temp,'          ',COMMENT4);
Writeln (temp,'          ',COMMENT5);
Writeln (temp,'          ',COMMENT6);
Writeln (temp,'          ',COMMENT7);
Writeln (temp,'          ',COMMENT8);
Writeln (temp,'          ',COMMENT9);
Writeln (temp,'          ',COMMENT10);
Writeln (temp,'          ',COMMENT11);
Writeln (temp,'          ',COMMENT12);
Close(temp);
end;

{makes sure the printer is set up}

ClrScr;
Writeln('   ');
Writeln('       **************************************************');
Writeln('       *   Please ensure your printer is connected        *');
Writeln('       *    in order to print out the reports.            *');
Writeln('       *                                                  *');
Writeln('       *   Press -> 1. to continue (printer ready)        *');
Writeln('       *            2. to abort (printer not available)   *');
writeln('      ***************************************************');

Read(kbd,key);


{after closing the file we print out the data in the format}
{resembling the report}
```

```
If key = ‘1’
THEN
Begin
Writeln(LST,’     Transport     Transports’);
Writeln(LST,’     Canada        Canada’);
Writeln(LST);

Writeln (LST,’                EMI CASE HISTORY’);
Writeln (LST);
Writeln (LST,’          REGION: ‘,REGION);
Writeln (LST,’          SITE: ‘,SITE);
Writeln (LST,’          PREPARED BY: ‘,PREPAREDBY, ‘ DESIGNATOR: ‘,DESIGNTOR);
Writeln (LST,’          DATE PREPARED: ‘,DATEP);
WRITELN(LST,’             TELEPHONE: (‘,TELEPHONE1,’)     ‘,TELEPHONE2,’-’,TELEPHONE3,’EXT.   ‘,TELE-
PHONE4);

Writeln (LST,’          DATE OF INTERFERENCE: ‘,DATEI);
Writeln (LST,’          PROBLEM DESCRIPTION: ‘,PROBLEM1);
Writeln (LST,’            ‘,PROBLEM2);
Writeln (LST,’            ‘,PROBLEM3);
Writeln (LST,’            ‘,PROBLEM4);
Writeln (LST,’          CAUSE IDENTIFIED: ‘,CAUSE1);
Writeln (LST,’            ‘,CAUSE2);
Writeln (LST,’            ‘,CAUSE3);
Writeln (LST,’            ‘,CAUSE4);
Writeln (LST,’          CORRECTIVE ACTION: ‘,CORRECTIVE1);
Writeln (LST,’            ‘,CORRECTIVE2);
Writeln (LST,’            ‘,CORRECTIVE3);
Writeln (LST,’            ‘,CORRECTIVE4);
Writeln (LST,’          COMMENTS: ‘,COMMENT1);
Writeln (LST,’            ‘,COMMENT2);
Writeln (LST,’            ‘,COMMENT3);
Writeln (LST,’            ‘,COMMENT4);
Writeln (LST,’            ‘,COMMENT5);
Writeln (LST,’            ‘,COMMENT6);
Writeln (LST,’            ‘,COMMENT7);
Writeln (LST,’            ‘,COMMENT8);
Writeln (LST,’            ‘,COMMENT9);
Writeln (LST,’            ‘,COMMENT10);
Writeln (LST,’            ‘,COMMENT11);
Writeln (LST,’            ‘,COMMENT12);
Writeln (LST, CHR (12));
END;


END. { PROGRAM C:REPORT2.PAS }
```

INSTRUCTIONS.PAS

```
{in the main program the variable "BeepOnSS" must be set to false}
{in procedure UPDOWN eliminate PGUP option of screen display line}


{the following two variables must be moved to the main}
{programs variable section}

temp:text;
x,key:char;



{The rest of this code must be put before the last}
{line of code in the main program and replace all code}
{including the REPEAT line}

{the following section sets the order of the screens}
{and has been changed so the program stops}
{if the user presses return on the first screen}

REPEAT

    CASE use_screenSS of
  1:  begin
              SCREEN_1; { C:INPUT }
              If indicator = ''
              then use_screenSS:=6
              else use_screenSS:= use_screenSS+1;
        end;
  2:  begin
              if (indicator <> '')
              THEN
              BEGIN
              SCREEN_2; { C:INPUT1 }

              UPDOWN; { Ask which way to go }
              END
                ELSE
                  use_screenSS:=0;
        end;

3:  begin
              If (T = 1)
              THEN
                BEGIN


              SCREEN_3; { C:INPUT11 }

              UPDOWN; { Ask which way to go }
                END
              ELSE
                  use_screenSS:=use_screenSS+1;
        end;
```

```
4:  begin
              If (T = 2)
              THEN
                BEGIN

              SCREEN_4; { C:INPUT2 }

              UPDOWN; { Ask which way to go }
              END
                   ELSE
                   use_screenSS:=use_screenSS+1;
              end;
  5:  begin
              If  (indicator <> '')
              THEN
                BEGIN

              SCREEN_5; { C:INPUT3 }

              UPDOWN; { Ask which way to go }
             END
                  ELSE
                    use_screenSS:=0;
         end;
    ELSE
          use_screenSS:=0;
    END; { CASE }

  UNTIL use_screenSS=0;

  If  (indicator <> '')
  THEN
  Begin

  {the following section makes sure the disk is ready}

  ClrScr;
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('    ');
  Writeln('       ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::');
  Writeln('       :  Please ensure that your session disk is in drive A  :');
  Writeln('       :  in order to save the report.                        :');
  Writeln('       :                                            :');
  Writeln('       :   Press -> 1. to continue (disk ready)              :');
  Writeln('       :               2. to abort (disk not available)       :');
  Writeln('       ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::');

  Read(kbd,key);
```

```
If key = ‘1’
THEN
Begin

{The following section opens the data file and prints the data}
{in the report form}

Assign(temp,‘a:emi.dat’);
Rewrite(temp);
Writeln(temp, ‘        Transport   Transports’);
Writeln(temp, ‘        Canada      Canada’);
Writeln(temp);
Writeln(temp,‘                ELECTROMAGNETIC INTERFERENCE (EMI) REPORT’);
WRITELN(temp);
WRITELN(temp,‘          SITE:  ‘,SITE,’        PREPARED BY: ‘,PREPAREDBY);
IF FACILITY = 1 then
Writeln(temp,‘         FACILITY: FSS’);
IF FACILITY = 2 then
Writeln(temp,‘         FACILITY: ATS’);

Writeln(temp,‘            TELEPHONE  NO.:  (‘,TELEPHONEA,’) ‘,TELEPHONEB,’-’,TELEPHONEC,’     EXT.
‘,TELEPHONED);
WRITELN(temp,‘          DATE: ‘,DATE);
WRITELN(temp);

Writeln(temp,‘         SECTION 1 - Interference to GROUND BASED Electronics Equipment’);
Writeln(temp);
Writeln(temp,‘          (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:’);
IF CR = ‘Y’ then
Write  (temp,‘          COMMUNICATIONS RECEIVER’);
IF MCT = ‘Y’ then
Writeln(temp,‘           MULTI-CHANNEL RECEIVER’);
IF VHFDF = ‘Y’ then
Write  (temp,‘          VHF-DF’);
IF CCS = ‘Y’ then
Writeln(temp,‘           COMMUNICATIONS CONTROL SYSTEM (CCS)’);
Writeln(temp,‘         OTHER EQUIPMENT: ‘, DESCRIBE2);
Writeln(temp,‘          ‘,DESCRIBE3);
Writeln(temp,‘         (b) FREQUENCY AFFECTED: ‘,FA1);
Writeln(temp,‘         (c) LOCATION OF AFFECTED ELECTRONICS EQUIPMENT: ‘);
Writeln(temp,‘          ‘,LOC3);
Writeln(temp,‘          ‘,LOC4);
WRITELN(temp);
Writeln(temp,‘         SECTION 2 - Interference to AIRBORNE Electronics Equipment’);
Writeln(temp);
Writeln(temp,‘          (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:’);
IF AGC = ‘Y’ then
WRITE  (temp,‘           AIR/GROUND COMMUNICATIONS’);
IF VOR = ‘Y’ then
Writeln(temp,‘          VOR’);
IF ILS = ‘Y’ then
Write  (temp,‘          ILS’);
IF ADF = ‘Y’ then
WRITELN(temp,‘           ADF’);
Writeln(temp,‘         OTHER EQUIPMENT: ‘,DESCRIBE1);
Writeln(temp,‘          ‘,DESCRIBE);
Writeln(temp,‘         (b) FREQUENCY AFFECTED: ‘,FA);
Writeln(temp,'          (c) AIRCRAFT IDENTIFICATION:',ID);
Writeln(temp,'          (d) AIRCRAFT MAKE/TYPE: ',AMT);
Writeln(temp,'          (e) LOCATION AND ALTITUDE WHEN INTERFERENCE WAS EXPERIENCED:');
Writeln(temp,'           ',LOC2);
WRITELN(temp);
Writeln(temp,'          SECTION 3 - Description of Interference');
Writeln(temp);
Writeln(temp,'          (a) DESCRIBE TYPE OF INTERFERENCE:');
Writeln(temp,'           ',INTERTYPE1);
Writeln(temp,'           ',INTERTYPE2);
Writeln(temp,'           ',INTERTYPE3);
                         IF OFTEN = 1 then
Writeln(temp,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: First Time');
                         IF OFTEN = 2 then
Writeln(temp,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Occasionally');
                         IF OFTEN = 3 then
Writeln(temp,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Often');
                         IF OFTEN = 4 then
Writeln(temp,'          (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Continuously');
                         IF DURATION = 1 then
Writeln(temp,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Seconds');
                         IF DURATION = 2 then
Writeln(temp,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Minutes');
                         IF DURATION = 3 then
Writeln(temp,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Hours');
                         IF DURATION = 4 then
Writeln(temp,'          (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Days');
                         IF EFFECT = 1 then
Writeln(temp,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable');
                         IF EFFECT = 2 then
Writeln(temp,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable with difficulty');
                         IF EFFECT = 3 then
Writeln(temp,'          (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Unusable');
Writeln(temp,'          (e) DATE AND TIME OF REPORTED INTERFERENCE:');
TIMEINTER:=Int(TIMEINTER);
Writeln(temp,'           ',DATEINTER,'        ',TIMEINTER:4:0,' (Z)');
Writeln(temp,'          (f) IF POSSIBLE, IDENTIFY PROBABLE CAUSE OF THIS INTERFERENCE:');
Writeln(temp,'           ',CAUSE);
Writeln(temp,'          (g) COMMENTS:');
Writeln(temp,'           ',COMMENT1);
Writeln(temp,'           ',COMMENT2);
Writeln(temp,'           ',COMMENT3);

Close(temp);
End;
End;

If (indicator <> '')
THEN
Begin

{the following section makes sure the printer is ready}
```

```
ClrScr;
Writeln(‘    ’);
Writeln(‘     **************************************************’);
Writeln(‘     *   Please ensure your printer is connected        *’);
Writeln(‘     *   in order to print out the reports.           *’);
Writeln(‘     *                                                *’);
Writeln(‘     *   Press -> 1. to continue (printer ready)        *’);
Writeln(‘     *            2. to abort (printer not available)   *’);
writeln(‘     **************************************************’);

Read(kbd,key);


{after closing the file we print out the data in the format}
{resembling the report}

If key = ‘1’
THEN
Begin
Writeln(LST, ‘         Transport   Transports’);
Writeln(LST, ‘         Canada      Canada’);
Writeln(LST);
Writeln(LST,‘                 ELECTROMAGNETIC INTERFERENCE (EMI) REPORT’);
WRITELN(LST);
WRITELN(LST,‘          SITE:  ‘,SITE,’        PREPARED BY: ‘,PREPAREDBY);
IF FACILITY = 1 then
Writeln(LST,’          FACILITY: FSS’);
IF FACILITY = 2 then
Writeln(LST,’          FACILITY: ATS’);

Writeln(LST,’             TELEPHONE  NO.:   (‘,TELEPHONEA,’) ‘,TELEPHONEB,’-’,TELEPHONEC,’     EXT.
‘,TELEPHONED);
WRITELN(LST,’          DATE: ‘,DATE);
WRITELN(LST);
IF T=1 THEN
BEGIN
Writeln(LST,’          SECTION 1 - Interference to GROUND BASED Electronics Equipment’);
Writeln(LST);
Writeln(LST,’           (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:’);
IF CR = ‘Y’ then
Write  (LST,’           COMMUNICATIONS RECEIVER’);
IF MCT = ‘Y’ then
Writeln(LST,’           MULTI-CHANNEL RECEIVER’);
IF VHFDF = ‘Y’ then
Write  (LST,’           VHF-DF’);
IF CCS = ‘Y’ then
Writeln(LST,’           COMMUNICATIONS CONTROL SYSTEM (CCS)’);
Writeln(LST,’          OTHER EQUIPMENT: ‘, DESCRIBE2);
Writeln(LST,’           ‘,DESCRIBE3);
Writeln(LST,’          (b) FREQUENCY AFFECTED: ‘,FA1);
Writeln(LST,’          (c) LOCATION OF AFFECTED ELECTRONICS EQUIPMENT: ‘);
Writeln(LST,’           ‘,LOC3);
Writeln(LST,’           ‘,LOC4);
END;
IF T=2 THEN
BEGIN
```

```
WRITELN(LST);
Writeln(LST,'          SECTION 2 - Interference to AIRBORNE Electronics Equipment');
Writeln(LST);
Writeln(LST,'           (a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:');
IF AGC = 'Y' then
WRITE  (LST,'              AIR/GROUND COMMUNICATIONS');
IF VOR = 'Y' then
Writeln(LST,'             VOR');
IF ILS = 'Y' then
Write  (LST,'             ILS');
IF ADF = 'Y' then
WRITELN(LST,'                ADF');
Writeln(LST,'           OTHER EQUIPMENT: ',DESCRIBE1);
Writeln(LST,'             ',DESCRIBE);
Writeln(LST,'           (b) FREQUENCY AFFECTED: ',FA);
Writeln(LST,'           (c) AIRCRAFT IDENTIFICATION:',ID);
Writeln(LST,'           (d) AIRCRAFT MAKE/TYPE: ',AMT);
Writeln(LST,'           (e) LOCATION AND ALTITUDE WHEN INTERFERENCE WAS EXPERIENCED:');
Writeln(LST,'             ',LOC2);
WRITELN(LST);
END;
Writeln(LST,'           SECTION 3 - Description of Interference');
Writeln(LST);
Writeln(LST,'           (a) DESCRIBE TYPE OF INTERFERENCE:');
Writeln(LST,'             ',INTERTYPE1);
Writeln(LST,'             ',INTERTYPE2);
Writeln(LST,'             ',INTERTYPE3);
                            IF OFTEN = 1 then
Writeln(LST,'           (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: First Time');
                            IF OFTEN = 2 then
Writeln(LST,'           (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Occasionally');
                            IF OFTEN = 3 then
Writeln(LST,'           (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Often');
                            IF OFTEN = 4 then
Writeln(LST,'           (b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Continuously');
                            IF DURATION = 1 then
Writeln(LST,'           (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Seconds');
                            IF DURATION = 2 then
Writeln(LST,'           (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Minutes');
                            IF DURATION = 3 then
Writeln(LST,'           (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Hours');
                            IF DURATION = 4 then
Writeln(LST,'           (c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Days');
                            IF EFFECT = 1 then
Writeln(LST,'           (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable');
                            IF EFFECT = 2 then
Writeln(LST,'           (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Usable with difficulty');
                            IF EFFECT = 3 then
Writeln(LST,'           (d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Unusable');
Writeln(LST,'           (e) DATE AND TIME OF REPORTED INTERFERENCE:');
TIMEINTER:=Int(TIMEINTER);
Writeln(LST,'             ',DATEINTER,'       ',TIMEINTER:4:0,' (Z)');
Writeln(LST,'           (f) IF POSSIBLE, IDENTIFY PROBABLE CAUSE OF THIS INTERFERENCE:');
Writeln(LST,'             ',CAUSE);
Writeln(LST,'           (g) COMMENTS:');
Writeln(LST,'             ',COMMENT1);
Writeln(LST,'             ',COMMENT2);
Writeln(LST,'            ',COMMENT3);

Writeln(LST, CHR(12));

END;
END;
```

IN2.PAS

```
{two variables to be added in the variables section of the }
{main program}

temp:text;
x,key:char;

{the following line is inserted after the BEGIN line of}
{the main program}

CLRSCR;

{in the main program the variable BeepOnSS should be changed to FALSE}

{The rest of this code is to be added before the last line}
{of the main program Report2.pas and after the line}
{UNTIL use_ScreenSS=0;}
{then recompile into a command file}


{check that the disk is ready}
ClrScr;
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');
Writeln('   ');

Writeln('       :::::::::::::::::::::::::::::::::::::::::::::::::::::::');
Writeln('       :  Please ensure that your session disk is in drive A  :');
Writeln('       :  in order to save the report.                        :');
Writeln('       :                                                      :');
Writeln('       :    Press -> 1. to continue (disk ready)              :');
Writeln('       :              2. to abort (disk not available)        :');
writeln('       :::::::::::::::::::::::::::::::::::::::::::::::::::::::');

Read(kbd,key):


If key = '1'
THEN
Begin

{open data file and write data in report form}

assign(temp,'a:emi1.dat');
rewrite (temp);

Writeln(temp,'    Transport    Transports');
Writeln(temp,'    Canada       Canada');
Writeln(temp);
```

```
Writeln (temp,'                    EMI CASE HISTORY');
Writeln (temp);
Writeln (temp,'         REGION: ',REGION);
Writeln (temp,'          SITE: ',SITE);
Writeln (temp,'          PREPARED BY: ',PREPAREDBY, ' DESIGNATOR: ',DESIGNTOR);
Writeln (temp,'          DATE PREPARED: ',DATEP);
WRITELN(temp,'          TELEPHONE: (',TELEPHONE1,')  ',TELEPHONE2,'-',TELEPHONE3,'EXT.  ',TELEPHONE4);
Writeln (temp,'          DATE OF INTERFERENCE: ',DATEI);
Writeln (temp,'         PROBLEM DESCRIPTION: ',PROBLEM1);
Writeln (temp,'           ',PROBLEM2);
Writeln (temp,'           ',PROBLEM3);
Writeln (temp,'           ',PROBLEM4);
Writeln (temp,'          CAUSE IDENTIFIED: ',CAUSE1);
Writeln (temp,'           ',CAUSE2);
Writeln (temp,'           ',CAUSE3);
Writeln (temp,'           ',CAUSE4);
Writeln (temp,'         CORRECTIVE ACTION: ',CORRECTIVE1);
Writeln (temp,'           ',CORRECTIVE2);
Writeln (temp,'           ',CORRECTIVE3);
Writeln (temp,'           ',CORRECTIVE4);
Writeln (temp,'         COMMENTS: ',COMMENT1);
Writeln (temp,'           ',COMMENT2);
Writeln (temp,'           ',COMMENT3);
Writeln (temp,'           ',COMMENT4);
Writeln (temp,'           ',COMMENT5);
Writeln (temp,'           ',COMMENT6);
Writeln (temp,'           ',COMMENT7);
Writeln (temp,'           ',COMMENT8);
Writeln (temp,'           ',COMMENT9);
Writeln (temp,'           ',COMMENT10);
Writeln (temp,'           ',COMMENT11);
Writeln (temp,'           ',COMMENT12);
Close(temp);
end;

{makes sure the printer is set up}

ClrScr;
Writeln('   ');
Writeln('      *********************************************************');
Writeln('      *   Please ensure your printer is connected          *');
Writeln('      *   in order to print out the reports.            *');
Writeln('      *                                              *');
Writeln('      *   Press -> 1. to continue (printer ready)        *');
Writeln('      *           2. to abort (printer not available)   *');
writeln('      *********************************************************');

Read(kbd,key);


{after closing the file we print out the data in the format}
{resembling the report}

If key = '1'
THEN
Begin
Writeln(LST,'     Transport     Transports');
Writeln(LST,'     Canada        Canada');
Writeln(LST);

Writeln (LST,'                  EMI CASE HISTORY');
Writeln (LST);
Writeln (LST,'          REGION: ',REGION);
Writeln (LST,'          SITE: ',SITE);
Writeln (LST,'          PREPARED BY: ',PREPAREDBY, ' DESIGNATOR: ',DESIGNTOR);
Writeln (LST,'          DATE PREPARED: ',DATEP);
WRITELN(LST,'          TELEPHONE: (',TELEPHONE1,')   ',TELEPHONE2,'-',TELEPHONE3,'EXT.  ',TELEPHONE4);

Writeln (LST,'          DATE OF INTERFERENCE: ',DATEI);
Writeln (LST,'          PROBLEM DESCRIPTION: ',PROBLEM1);
Writeln (LST,'            ',PROBLEM2);
Writeln (LST,'            ',PROBLEM3);
Writeln (LST,'            ',PROBLEM4);
Writeln (LST,'          CAUSE IDENTIFIED: ',CAUSE1);
Writeln (LST,'            ',CAUSE2);
Writeln (LST,'            ',CAUSE3);
Writeln (LST,'            ',CAUSE4);
Writeln (LST,'          CORRECTIVE ACTION: ',CORRECTIVE1);
Writeln (LST,'            ',CORRECTIVE2);
Writeln (LST,'            ',CORRECTIVE3);
Writeln (LST,'            ',CORRECTIVE4);
Writeln (LST,'          COMMENTS: ',COMMENT1);
Writeln (LST,'            ',COMMENT2);
Writeln (LST,'            ',COMMENT3);
Writeln (LST,'            ',COMMENT4);
Writeln (LST,'            ',COMMENT5);
Writeln (LST,'            ',COMMENT6);
Writeln (LST,'            ',COMMENT7);
Writeln (LST,'            ',COMMENT8);
Writeln (LST,'            ',COMMENT9);
Writeln (LST,'            ',COMMENT10);
Writeln (LST,'            ',COMMENT11);
Writeln (LST,'            ',COMMENT12);
Writeln (LST, CHR (12));
END;
```

PICTURE.PAS

```
{
L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R
L5R                        INSIGHT 2+                        L5R
L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R

File Name       : Picture

H/W Environment : IBM PC and Compatibles

OS Environment  : MS DOS or PC DOS 2.0 or later

Compiler        : Turbo Pascal Ver 3.0

Description     : This programs assumes it has been activated by
                                 INSIGHT 2+ and fetches a program name from its
                                 DOS header record. The filename and extension is
                                 extracted and the named graphics file is opened.
                                 The file is read directly onto the graphic memory
                                 area for a CGA card. The program then waits for
                                 a continue key F2 or a return.

Call Via : AND ACTIVATE Picture COMMAND <option>,<[drive:path\]picture[.extension]>

                        option :
                        0 = text mode        - 25 lines of 80 characters (non-compressed)
                        1 = graph color mode - 320 x 200 dots color graphics
                                                              (non-compressed)
                        2 = high resolution  - 640 x 200 dots black + one color graphics
                                                              (non-compressed)
                        3 = graph color mode - 320 x 200 dots color graphics
                                                              saved via TeleGraphic's SaveGraf program

Revision        : 1.0

L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R L5R
}
program picture;
const
   pict_size = 16384;
type
   string80 = string[80];
var
   ch               : char;
   code, inp, option : integer;
   path             : string80;
   picture_file_name : string80;
   pict_file        : file;
   screen           : array [1..8000] of byte absolute    $B800:0000;
   screen1          : array [1..4000] of integer absolute $B800:0000;
   screen2          : array [1..4000] of integer absolute $BA00:0000;
   blk              : array [1..32000] of byte;
   iblk             : array [1..16000] of integer absolute blk;
{
************************************************************************************
*  Name : message
*  Audit:
***************************************************************************
}
procedure message (mess_no : integer);
begin
    gotoxy (1, 24);
    textcolor (lightred);
    textbackground (black);
    case mess_no of
        1 : write (‘Picture : You need a graphics card to run this program.’);
        2 : write (‘Picture : You need to specify a display mode between 0 and 2.’);
        3 : write (‘Picture : Could not find the directory specified on the picture name.’);
        4 : write (‘Picture : Could not open the picture file.’);
    end;
    delay (3000);
end;
{
***************************************************************************
*  Name : color_monitor
*  Audit:
***************************************************************************
}
function color_monitor : boolean;
type
    registers = record
        ax,bx,cx,dx,bp,si,di,ds,es,fg : integer;
    end;
var
    regs : registers;
begin
    Regs.AX := $0F00;
    Intr ($010, Regs);
    color_monitor  := (Regs.AX and $00FF) <> 7;
end;
{
***************************************************************************
*  Name : extract_filename
*  Audit:
***************************************************************************
}
procedure extract_filename (in_str : string80;
                                              var filename : string80;
                                              var path      : string80;
                                              extension     : string80);
var
    edge : boolean;
    len, i : integer;
begin
    len := length (in_str);
    for i := 1 to len do
        if ord(in_str[i]) > $60 then in_str[i] := chr(ord(in_str[i]) - $20);
    edge := false;
    i := len;
    repeat
        if (in_str[i] = ‘\’) or (in_str[i] = ‘:’) then edge := true else i := i - 1;
    until edge or (i=0);
    if edge then begin
        if in_str[i] = '\' then
            path := copy (in_str, 1, i-1)
        else
            path := copy (in_str, 1, i);
        filename := copy (in_str, (i+1), (len-i));
    end else filename := in_str;
    if pos ('.', filename) = 0 then filename := filename + extension;
end;
{
****************************************************************************************
*  Name : text_mode
*  Audit:
****************************************************************************************
}
procedure text_mode;
begin
    textmode (C80);
    blockread (pict_file, screen, 1);
    if ioresult <> 0 then message (4);
end;
{
****************************************************************************************
*  Name : graph_color_mode
*  Audit:
****************************************************************************************
}
procedure graph_color_mode;
begin
    graphcolormode;
    palette(2);
    blockread (pict_file, screen, 1);
    if ioresult <> 0 then message (4);
end;
{
****************************************************************************************
*  Name : hires_mode
*  Audit:
****************************************************************************************
}
procedure hires_mode;
begin
    hires;
    blockread (pict_file, screen, 1);
    if ioresult <> 0 then message (4);
end;
{
****************************************************************************************
*  Name : Savegraf_mode
*  Audit:
****************************************************************************************
}
procedure SaveGraf_mode;
var
    top : boolean;
    marker, n_bytes, x, i, repeats, in_index: integer;
```

```
begin
    blockread (pict_file, blk, 1);
    if ioresult = 0 then begin
        top := true;
        in_index := 10;
        x := 1;
        n_bytes := 0;
        marker := (blk[17]*256 + blk[16]);
        graphcolormode;
        repeat
            if iblk[in_index] = marker then begin
                in_index := in_index + 1;
                repeats := iblk[in_index];
                in_index := in_index + 1;
                for i := 1 to repeats do begin
                    if top then
                        screen1 [x] := iblk [in_index]
                    else
                        screen2 [x] := iblk [in_index];
                    if ((x mod 40) = 0) then
                        if top then begin
                            x := x - 40;
                            top := false;
                        end else
                            top := true;
                    x := x + 1;
                    if x > 4000 then exit;
                end;
                in_index := in_index + 1;
                n_bytes := n_bytes + repeats * 2 + 4;
            end else begin
                if top then
                    screen1 [x] := iblk [in_index]
                else
                    screen2 [x] := iblk [in_index];
                if ((x mod 40) = 0) then
                    if top then begin
                        x := x - 40;
                        top := false;
                    end else
                        top := true;
                x := x + 1;
                in_index := in_index + 1;
                n_bytes := n_bytes + 2;
            end;
        until x > 8000;
    end else message (4);
end;
{==================== begin Picture ==============================}
begin
    if color_monitor then begin
        val (copy (paramstr (1), 1, 1), option, code);
        if (code in [0, 2]) and (option in [0..3]) then begin
            getdir (0, path);
            extract_filename (copy(paramstr(1), 3, length (paramstr(1))-2),
            picture_file_name, path, '.PIC');
            chdir (path);
```

```
                if ioresult = 0 then begin
                    assign (pict_file, picture_file_name);
                    if ioresult = 0 then begin
                        reset (pict_file, pict_size);
                        if ioresult = 0 then begin
                            case option of
                                0 : text_mode;
                                1 : graph_color_mode;
                                2 : hires_mode;
                                3 : SaveGraf_mode;
                            end;
                            close (pict_file);
                            if ioresult = 0 then
                                repeat until keypressed; read (kbd, ch);
                        end else message (4);
                    end else message (4);
                end else message (3);
            end else message (2);
        end else message (1);
        textmode (C80);
    end.
```

EMI.BAT

```
cd  c:\emia\emib
echo off
picture  1,screen.0
report1
cd  c:\emia
i2
cd c:\
```

Transport Transports
Canada Canada

ELECTROMAGNETIC INTERFERENCE (EMI) REPORT

SITE: Ottawa International PREPARED BY: John Jones
FACILITY: ATS
TELEPHONE NO.: (613) 000-0000 EXT. 0000
DATE: 03/31/88

SECTION 1 - Interference to GROUND BASED Electronics Equipment

(a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:
OTHER EQUIPMENT:
(b) FREQUENCY AFFECTED:
(c) LOCATION OF AFFECTED ELECTRONICS EQUIPMENT:

SECTION 2 - Interference to AIRBORNE Electronics Equipment

(a) IDENTIFY ELECTRONICS EQUIPMENT AFFECTED:
ILS OTHER EQUIPMENT:
(b) FREQUENCY AFFECTED: 100 Mhz.
(c) AIRCRAFT IDENTIFICATION:BW0001T
(d) AIRCRAFT MAKE/TYPE: Boing 747
(e) LOCATION AND ALTITUDE WHEN INTERFERENCE WAS EXPERIENCED:

SECTION 3 - Description of Interference

(a) DESCRIBE TYPE OF INTERFERENCE:
Loud, Harsh
(b) HOW OFTEN DOES THIS INTERFERENCE OCCUR: Occasionally
(c) DURATION OF THE INTERFERENCE CAN BE MEASURED IN: Seconds
(d) EFFECT ON EQUIPMENT OR SYSTEM OPERATION: Unusable
(e) DATE AND TIME OF REPORTED INTERFERENCE:
03/28/88 1200 (Z)
(f) IF POSSIBLE, IDENTIFY PROBABLE CAUSE OF THIS INTERFERENCE:
FM Station
(g) COMMENTS:
None

Transport Transports
Canada Canada

EMI CASE HISTORY

REGION: Ontario
SITE: Ottawa International
PREPARED BY: John Jones DESIGNATOR: OTEEM
DATE PREPARED: 03/31/88
TELEPHONE: (613) 000-0000EXT. 0000
DATE OF INTERFERENCE: 03/28/88
PROBLEM DESCRIPTION: Loud, Harsh

CAUSE IDENTIFIED: FM Stations

CORRECTIVE ACTION: Frequency Change

COMMENTS: None